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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

**AN ANALYSIS OF THE UNITED STATES MARITIME
INDUSTRY AND ITS ABILITY TO MEET NATIONAL
SECURITY STRATEGY REQUIREMENTS**

by

Antonio Oropeza
Brian E. DeLaney

March 2001

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**AN ANALYSIS OF THE UNITED STATES MARITIME INDUSTRY AND ITS
ABILITY TO MEET NATIONAL SECURITY STRATEGY REQUIREMENTS**

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MASTER OF SCIENCE IN MANAGEMENT

from the


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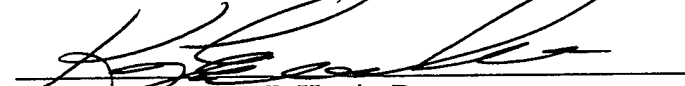

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ABSTRACT

The mariner pool was not an issue of concern until Operations Desert Shield/Desert Storm brought about the largest fleet activation since the Vietnam Conflict. To meet Ready Reserve Force crewing requirements during the Gulf War, mariners from the Great Lakes and retired mariners ranging up to eighty years of age were mobilized. Additionally, Military Sealift Command had to hire as many as 162 foreign-flag ships to supplement its sealift capabilities. This raised concerns over the mariner pool and its effects on national sealift capabilities in terms of the national defense strategy. However, there is no organization that can state and validate the number of U.S. Merchant Marines.

The objective of this study is to determine if there are enough qualified Merchant Mariners to meet the crewing requirements brought on by two nearly simultaneous major theater wars without sacrificing manning levels in the commercial fleet. Part of this project also analyzed the maritime industry to determine the causes of the mariner shortage. Although research did not yield the data necessary to determine actual size of the mariner pool, estimates suggest that the number of mariners available is not sufficient to fulfill surge requirements in support of national sealift strategy.

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LIST OF ACRONYMS

ABS	American Bureau of Shipping
AMC	Air Mobility Command
BIMCO	Baltic and International Maritime Council
CPF	Combat Prepositioning Force
CRAF	Civil Reserve Air Fleet
DoD	Department of Defense
EUSC	Effective U.S. Control
FoC	Flag of Convenience
FSS	Fast Sealift Ships
IMO	International Maritime Organization
ISF	International Shipping Federation
ISU	International Seaman's Union
LASH	Lighter Aboard Ship
LMSR	Large Medium-Speed Roll-on/Roll-off
LPF	Logistics Prepositioning Force
MARAD	Maritime Administration
MEBA	Marine Engineer's Beneficial Association
MMLD	Merchant Mariner Licensing and Documentation system
MPF	Maritime Prepositioning Force
MRS-05	Mobility Requirements Study for 2005
MSC	Military Sealift Command
MSP	Maritime Security Program
MTMC	Military Traffic Management Command
MTS	Mariner Tracking System
MTW	Major Theater War
NDRF	National Defense Reserve Fleet
OPDS	Offshore Petroleum Discharge System
RO/RO	Roll-on/Roll-off
RRF	Ready Reserve Force
SEAS	Seafarers Employment Analysis System
SIP	Student Incentive Payment
SIU	Sailors International Union
SRP	Sealift Readiness Program
STCW	Standards of Training, Certification, and Watchkeeping
USCG	United States Coast Guard
USTRANSCOM	United States Transportation Command
VISA	Voluntary Intermodal Sealift Agreement

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I. INTRODUCTION

A. BACKGROUND

Throughout its history, the United States has relied heavily on seapower to carry out foreign policy and stay competitive in world trade. America's ability to project its power to distant shores is assured by a maritime strategy that includes a superior Navy and strong U.S. Merchant Marine. A strong Maritime Industry is essential to our nation's success in the world trade market and is a crucial element during time of crisis when it becomes necessary to move vast amounts of cargo and personnel over great distances in a timely manner. Yet, this vital asset has been in steady decline for the last 50 years.

At its peak in 1950, the U.S. Merchant Fleet consisted of 1,050 privately owned ships (Ref. 1:p. 27) while the National Defense Reserve Fleet (NDRF) held 2,277 ships (Ref. 2:p. 56). Unfortunately, this vital asset has been steadily declining since then. As of 1999, the U.S. Merchant Fleet consisted of a mere 281 ships (Ref. 1:p. 27) while the NDRF consisted "of 258 vessels, primarily dry cargo ships, with some tankers, military auxiliaries, and other types of vessels. However, 85 are no longer militarily useful and others are slated for scrapping" (Ref. 3:p. 78). This is not to say the NDRF is completely useless, one of the subcomponents of the NDRF is the Ready Reserve Fleet (RRF), a group of 91 vessels that are one of the key cornerstones to the military's sealift capabilities. The RRF and NDRF will be explained in more detail later on.

The gravity of this problem did not materialize until the U.S. began to mobilize in preparation for the Persian Gulf War. When the Maritime Administration (MARAD) broke out the first 42 Ready Reserve Fleet (RRF) ships, it had to "comb union halls and retirement rolls to round up civilian crews to man them" (Ref. 4:p. 6). To meet RRF

crewing requirements during Desert Shield/Desert Storm, mariners from the Great Lakes and domestic inland waterways, as well as retired mariners ranging up to eighty years of age, were mobilized. Also, by the time the ground war started, the military's sealift authority, Military Sealift Command (MSC), had to charter 162 foreign ships to supplement its sealift capabilities (Ref. 2:p. 263). This raises serious issues about the strength of the U.S. merchant marine as it pertains to maritime strategy, especially with the critical role the United States plays in world politics.

America's industrial, economic, and military leadership propelled it to become the sole world superpower it is today. As such, the world often looks to the U.S. in times of crisis. The U.S. must also depend on its might to protect its national interests and those of its allies anywhere in the world. Nevertheless, it has neglected its merchant marine to the point where countries such as Cypress and Liberia have more ships registered under their flag. Since 1970, many other nations have increased the size of their fleet as a means of projecting visibility and earning hard currency. While the U.S. fleet's tonnage has only decreased by about fifty percent, due to larger ships and containerization, these ships remain less than four percent of the world fleet by tonnage as shown in Figure 1 (Ref. 5:p. 23). These statistics raise serious concerns about the lone superpower's ability to fulfill its commitments around the world.

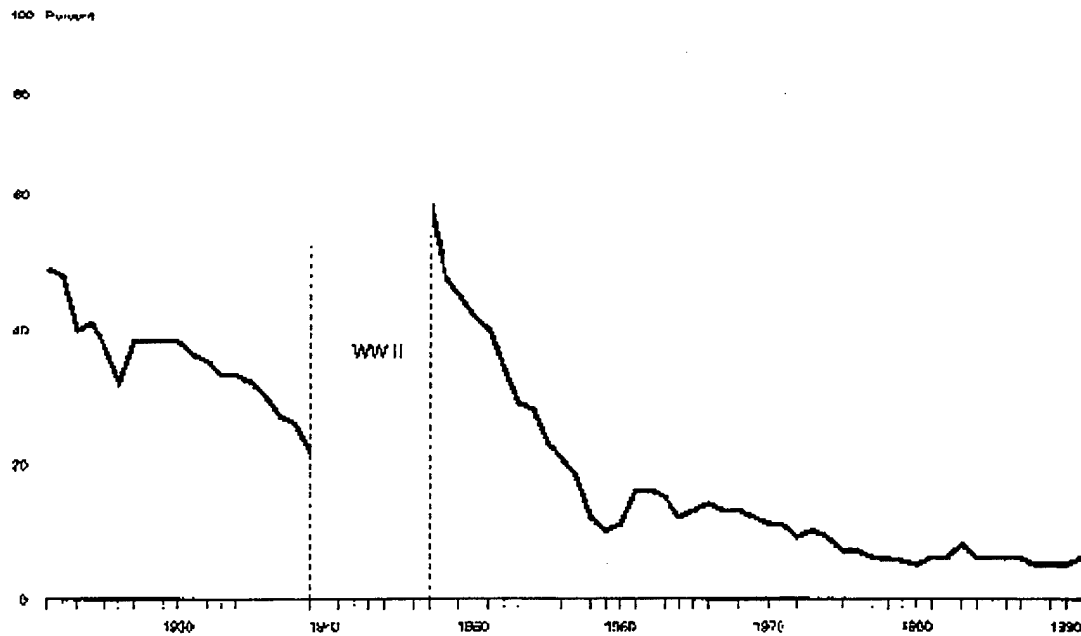


Figure 1. U.S. Oceanborne International Trade, 1921-1992 – Percentage Carried on U.S. Flag Vessels From Ref [5].

The factors that led to these statistics have been well studied over the years. They can be narrowed down to several principle reasons. The level of protection for seafarer health, welfare, and safety are lower on non-U.S. ships. Safety standards enforced on U.S. ships are some of the most stringent in the world, requiring additional safety equipment and training compared to some of the flag of convenience nations. Double hulled tankers are now required for the oil carriers in Alaska. As the name implies, these ships must have two hulls to prevent oil spills, and are vastly more expensive than the single hulled vessels used by other countries. Another factor contributing to the decline is the regulatory framework in several countries, including key trading partners, which restrict free access, or otherwise permit discriminatory practices against U.S. flag vessels. This enables foreign vessels to operate at a lower cost or with substantial preferential treatment compared to U.S. carriers. Foreign-flag ship operators do not pay corporate

income taxes, and foreign flag crews often pay no personal income taxes. Additionally, the only U.S. corporate or income taxes paid by foreign flag owners are taxes paid on their U.S. shore-based facilities and personnel, which is often non-existent. However, vessels operating under the U.S. flag are subject to all the taxes and regulatory laws applicable in the United States (Ref. 6:p. 7). By far the most blatant difference between foreign flag and American flag ship is the cost of labor. The cost to man a U.S. vessel can almost be 20 times that of labor on a foreign ship (Ref. 5:p. 8). Requiring more men at a much higher wage rate, companies that operate under the American flag have a very difficult time staying in business and producing any profit.

While the government has created several programs to ensure enough ships are available to fulfill the cargo capacities of military surge requirements, a solution to increase the mariner pool remains illusive. Concerns over mariner manpower levels have moved some organizations to study the issue and begin to track mariners. However, there is no single organization that can clearly state the number of mariners available, or the existing crewing requirements for the U.S. commercial fleet. The billet requirements of the government fleet can be determined, but it would be difficult to guarantee that all the ships could be manned if required. Part of the reason it is difficult to ascertain the number of available mariners is because they belong to several different unions and work for different companies. Unions are under no obligation, nor do they feel compelled to provide any mariner information, even to government agencies such as the Maritime Administration (MARAD). The primary source that MARAD uses to collect data on mariners is the United States Coast Guard, the government agency responsible for mariner testing and certification, and issuance of licenses and documents. However,

simply tracking licenses and documents does not necessarily mean that these mariners are available, qualified, or willing to sail in a contingency.

B. OBJECTIVE

The objective of this research is to determine if there is a sufficient number of qualified merchant mariners to meet the crewing requirements brought on by a contingency without sacrificing manning levels in the commercial fleet. Part of this project will also analyze the United States maritime industry to determine the causes of the mariner shortage, if one exists.

C. RESEARCH QUESTIONS

1. Primary Question

- Is there a sufficient number of available, willing, and able licensed and unlicensed merchant mariners to man the billet surge (surge billets) connected with sealift requirements of a national contingency?

2. Secondary Research Questions

- Who tracks mariner manpower and why is there uncertainty about mariner manpower levels?
- How many billets exist under normal conditions and how many more would a contingency require?
- Is there a real shortage of mariners? If so, what has caused the shortage?

- What are the consequences of a mariner shortage during a national contingency and what policies and procedures can be considered to increase the mariner pool?

D. SCOPE, LIMITATIONS, AND ASSUMPTIONS

This thesis will include a review and brief analysis of current U.S. Maritime Policy, and a review of various maritime programs, such as the Maritime Security Program, Voluntary Intermodal Sealift Agreement, and the National Defense Reserve Fleet/Ready Reserve Fleet. The mariner manpower pools and sources will be identified as well as the maritime organizations whose functions depend on mariners. Finally, the roles of the U.S. Department of Transportation, United States Maritime Administration, U.S. Coast Guard, United States Transportation Command, Military Sealift Command, and maritime unions will be reviewed.

The data, which was collected from multiple sources, varied greatly from source to source. Most of the sources gave no references to back up the stated numbers. For the sake of this thesis, the numbers in the sources are assumed to be the most accurate available. Additionally, this thesis focuses only on American flag commercial vessels, United States government-owned vessels, and United States citizen mariners.

E. METHODOLOGY

A simple logic chain is used to determine whether the current maritime industry is capable of meeting the national security requirement to support two nearly-simultaneous major theater wars. This will be covered further in Chapter II.

F. ORGANIZATION

This thesis is organized into eight chapters and nine appendixes. Chapter I serves as an introduction to the research issues.

Chapter II lays out the methodology which was used for this thesis.

Chapter III explains the major responsible agencies in the United States Maritime Industry and their roles in the current trends of the merchant marine.

Chapter IV explains some of the main maritime policies and programs currently in place and their affect on the maritime industry.

Chapter V analyzes the United States Maritime Industry using a policy analysis systems model.

Chapter VI defines what the National Security Strategy as it relates to sealift, and the approximate tonnages required to be moved to meet that strategy, as well as listing the various sealift assets the nation can call on.

Chapter VII converts the required tonnage to ships that would be needed, and compares the billets on those ships with the estimated number of merchant mariners in the employment pool.

Chapter VIII gives the findings and recommendations and the conclusion.

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II. METHODOLOGY

A. INTRODUCTION

This chapter discusses the methodology used for this study. As stated in the introduction of this thesis, this research questions if there are enough qualified merchant mariners to meet the crewing requirements of a contingency without sacrificing manning levels in the commercial fleet. On the surface, this appears as one question, but it really involves two issues. On one hand, the number of licensed and unlicensed mariners available and qualified to sail must be ascertained. On the other hand, the crewing requirements of the various maritime organizations that draw from these mariner pools must be assessed. This being the case, this methodology will address the number of mariners and the requirements, a seemingly simple logic chain.

Unfortunately many insurmountable obstacles surfaced while pursuing this logic chain. In some cases no data was available, in others the data was not adequate to fulfill the purpose of this thesis. This chapter presents the simple logic chain and its shortcomings.

B. THE SIMPLE LOGIC CHAIN

In formulating an approach to the thesis, it became evident that the research would best be served by getting to the very root of the sources that determine requirements and the sources that maintain the manpower pools. This required the researchers to follow through a series of questions, starting with the effect (current situation) and asking about the cause, and repeating the process until reaching the origin of the simple logic chain. The basic question asks whether there are enough mariners to

respond to a national contingency. In addressing the first part of this question, the number of mariners can be ascertained by summing the number of union and nonunion mariners. This requires data from maritime unions and shipping companies. However, simply determining the size of the mariner pool available does not answer the question completely, because the requirements must be known.

The next question that must be addressed is how these requirements are determined. It is evident that a national contingency would require a large number of mariners. But just how many mariners are needed is determined by the number of ships to be mobilized. The number of ships to be mobilized depends on the cargo to be moved. In turn, the cargo to be moved depends on the military plans tied to the national strategy. Lastly, national strategy depends upon the perceived threat in the global environment.

The simple logic chain, as applied below, is a basic process that traces the causes and effects to eventually determine number of mariners available and manpower requirements.

1. Cargo Capacity and Ship Requirements Methodology

Having traced the issue to its roots, this research started with the perceived treat in the global environment, which affects national strategy; this strategy requires a surge capacity that demands so many ships, which in turn require so many mariners. These steps are discussed in the following paragraphs.

Countries such as Iraq, North Korea, and Iran are but a few countries that give rise to perceived threats in the global environment. To determine the position the United States has in response to this, it was necessary to review documents such as *A National*

Security Strategy of Engagement and Enlargement. This document states that the United States national strategy calls for its armed forces to be capable of winning two nearly simultaneous major theater wars (MTW).

The next step was to determine how much cargo capacity was required to support two nearly simultaneous major theater wars. Inquiries at the Navy's Operational Logistics and Strategic Mobility Division (OPNAV N42) and the Maritime Administration pointed to the Mobility Requirements Study - 2005 (MRS-05), which is a comprehensive review of the military's airlift and sealift capabilities. This study provided the estimated number of ships, voyages, and cargo capacity required to support two MTWs. It should be noted however, that the cargo capacities provided with the study were tied to specific ships, but no explanation was included as to precisely how the total cargo capacity requirements to support two MTWs were established, which was also the intent of the study.

Given that the term "major" in two major theater wars refers to a conflict similar in magnitude to Operation Desert Shield/Desert Storm, additional sealift data from this period was collected. This data included the amount and type of cargo that was moved and the number and types of ships that supported the war effort. These figures were then multiplied by two and compared to the MRS-05 estimates as a validation.

2. Ship and Cargo Capacity Availability Methodology

Having assessed the ship and tonnage requirements necessary to meet the national security strategy, it became necessary to determine the number of ships and the cargo capacity the United States has at its disposal to support its strategy. Data was collected for vessels in the following categories: Prepositioned Vessels, Fast Sealift Ships, Ready

Reserve Fleet, Voluntary Intermodal Sealift Agreement, Maritime Security Program, and U.S. flag commercial fleet. Merchant ships from allied and other nations are not included in this estimate because there are no guarantees that other nations will support our next armed conflict.

3. Merchant Mariner Requirement Methodology

With the number and types of ship determined, the next step was to estimate the mariners required to man these ships. To this end, it is important to recognize that the number of billets is not equal to the required number of sailors. A ratio of 1.5 mariners for every billet is used to account for mariners on vacation but still employed on a ship or by a union.

4. Merchant Mariner Availability Methodology

Labor unions, shipping companies, the U.S. Coast Guard and the Maritime Administration (MARAD) were contacted in order to determine the size of the mariner pool. Since labor unions control some mariner pools, letters were written and telephone calls were made to explain the purpose of this thesis and request information about the number of members and the licenses/documents they held. The same information was requested from shipping companies.

Given that the U.S. Coast Guard issues licenses and qualifications, they were contacted to obtain information on number and type of licenses or qualifications issued per year; number of renewals per year; and number of upgrades per year.

MARAD was contacted to request information on the number of mariners available by category, and the number of ships and their capacities available through the various military support programs and in the U.S. commercial fleet. The National

Defense Transportation Association was also contacted for information. However, the information obtained from this organization could not be verified so it was not used in this thesis.

C. DATA SHORTFALLS

There were several obstacles that limited the scope and effectiveness of this study. To begin, the MRS-05 study is a classified document; only the executive summary is unclassified. Therefore, access to the document was very limited. For instance, the section summarizing how the actual tonnage needed to support two MTWs was not available. Although information on the ships required and their cargo capacity was available, there was no indication as to how the required tonnage was estimated.

To compound these data problems, capacity measurements are not consistent. The capacities for some vessels are provided in deadweight tons, some in square feet of deck space, and others in twenty-foot container equivalent units. This makes it difficult to compare vessel capacities. Furthermore, no documents were found that clearly delineated the number of mariners that were necessary to operate each type of ship.

Perhaps the greatest data shortfall involved determining the number of mariners available. The labor unions, shipping companies and the U.S. Coast Guard National Maritime Center were unable to provide the requested data. While MARAD was very cooperative, the data systems it is currently using were not able to provide the data necessary for this thesis.

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III. MARITIME INDUSTRY RESPONSIBLE AGENCIES

A. MARITIME UNIONS

Maritime labor unions arose in reaction to the harsh treatment of many mariners by the shipping companies in the nineteenth century. Discipline onboard a ship was absolute and the ship's officers had powers similar to naval officers during wartime. Once a sailor signed articles binding him to a ship, he was essentially an indentured servant to the ship or company. Andrew Furuseth founded the first seaman's union in 1895, the International Seaman's Union (ISU). By 1915 ISU had enough political and moral strength to influence the passage of laws establishing standards for quarters and food onboard U.S. Flag ships. The union was also instrumental in promoting the passage of the Merchant Marine Act of 1936 (Ref. 2:p. 160). Another union actually had roots earlier than the ISU; the Master's Mates and Pilots was founded in 1887 as a professional association of harbor pilots, but it did not become a bona fide labor union until after World War II.

The maritime unions gained the same rights as industrial workers under the National Labor Relations Act of 1935. This officially allowed them to organize, bargain collectively, and strike. The unions emerged as the primary backer for the subsidy provisions of the Merchant Marine Act of 1936. From the late 1940's, organized labor took the lead and assumed the task of securing government approval for maritime industry subsidies, allowing the shipping companies to meet union demands for higher salaries. They justified these higher salaries as being covered by the subsidies. This began a spiral of events that led to shipping companies essentially becoming the intermediaries transferring government subsidies into labor salaries, until the moderate

subsidies could cover the high mariner wage costs, but few of the other expenses of competing with foreign flag vessels (Ref. 7:p. 115).

The Second World War might have saved the industry from this inflationary wage spiral. The nation's leaders were unsure of how to treat the men and women sailing on the ships carrying the military's cargo. Naturally, the unions and merchant seamen were concerned about the possible militarization of the merchant marine. They wanted to avoid uniforms, saluting, and all the additional paperwork associated with the military. In fact, the unions were on strike in the months immediately preceding the attack on Pearl Harbor. Seamen were kept in a civilian status and not made a branch of the military. Therefore, the War Shipping Administration could not use the draft and instead had to use higher wages to entice people to sail. In effect, what could have helped the industry only continued to raise the wages (Ref. 7:p. 145).

A maritime union operates differently from other labor unions, due to the industry's nature. Typically a U.S. steamship company has a few ships' officers as permanent crew. The rest of the crew comes from the union hiring halls. Unions send out sailors and engineers based on their seniority and the time rested from their last voyage. Steamship companies have little to no say as to who is hired to sail their ships. Seamen may be disciplined for violating union regulations, but not usually by the company. This system has its problems, but it is preferable to the shakedowns and bribery that ran the process in the early part of the 1900s (Ref. 2:p. 156).

The unions have done many good things for the American merchant sailor, including setting standards for shipboard quality of life and safety. However, they have also caused some problems with which the industry is struggling with. First, the

maritime academies and union schools produce approximately 3,770 officers per year, but not all of them can or will enter a union. Most of them find maritime related jobs ashore and a few join the armed forces. Second, shipping companies are not allowed to operate at their maximum efficiency because unions set manning requirements exceeding those needed to operate ships efficiently. Third, unions demand high wages for their members, relative to other international shipping companies. Crew costs can account for as much as 50% of a ship's operating cost (Ref. 2:p. 102). Fourth, the unions' ability to picket a ship or ships can quickly create sizable losses for shipping companies. These are a few of the reasons that drive U.S. shipping companies to foreign flags of convenience, where they are free to hire only the labor they need and at a lower rate. This in turn reduces the number of U.S. sailing jobs, forcing unions to limit membership even more.

Each union has its own membership about which they closely guard all information. They balk at providing any type of data to government agencies and even then only give the bare minimum. Table 1 compares the employment of mariners on U.S. flag vessels with the membership in the major shipboard unions (Ref. 2:p. 159). Table 2 lists the main labor unions that provide mariners to the U.S. merchant fleet and their approximate membership (Ref. 2:p. 162). The misleading thing about the number of union members is that this total may include pensioners or retired sailors. This issue will be addressed further in Chapter VII.

Year	Employment	Year	Union Membership
1929	63,800	1936	At least 22,500
1938	49,800		
1945	158,900		
1950	56,600	1948	144,000
1952	70,700	1953	112,500
1960	49,200	1963	135,500
1968	54,200		
1970	37,600	1971	145,000
1980	19,600	1979	137,000
1986	11,600		
1992	9,200	1991	119,000

Table 1. U.S. Maritime Employment versus Membership in Shipboard Unions from 1929-1992.

Union	1936	1948	1953	1963	1971	1979	1991
Masters, Mates & Pilots	25,000	5,000	9,000	9,000	10,000	10,000	10,000
Marine Engineers Beneficiary Association	N/A	19,000	13,500	11,500	10,400	13,500	10,000
National Maritime Union	N/A	75,000	43,000	42,000	45,000	30,000	18,000
American Radio Association	N/A	N/A	2,000	2,000	1,000	1,000	1,000
Seaman's International Union	20,000	45,000	45,000	70,000	80,000	84,000	80,000

Table 2. Approximate Union Membership from 1936-1991.

Previously strong unions have been weakened by the steady decline of the U.S. fleet. They have felt the sting of the disappearing mariner pool, so much so that many unions have waived the initiation fees for new members; these fees can exceed two thousand dollars. Despite this situation, the unions are still fragmented. Instead of presenting a unified voice for maritime issues, they often lobby separately with little result. Truly unified labor could benefit the maritime industry by providing a common front and a powerful lobby.

B. MILITARY SEALIFT COMMAND

Within the Department of Defense, sealift is the responsibility of the Military Sealift Command (MSC), one of the three components of the United States Transportation Command (USTRANSCOM), along with the Air Mobility Command (AMC) and the Military Traffic Management Command (MTMC). MSC operates approximately 130 vessels through five general programs; Naval Fleet Auxiliary Force (NFAF), Special Missions, Prepositioning, Ship Introduction and Sealift. Appendix A lists the vessels in the current MSC fleet.

The NFAF vessels provide underway replenishment for Naval combatant forces. Providing fuel, food, ammunition, spare parts and other supplies, Naval Fleet Auxiliary Force (NFAF) ships enable the Navy fleet to operate at the highest operational tempo possible. Operating thirteen tankers, six combat stores ships, five ocean-going tugs, and seven ammunition ships on both coasts of the United States and overseas, MSC is almost the sole source for replenishing Naval ships at sea. The two hospital ships, USNS Mercy and USNS Comfort, also come under the NFAF fleet. The impressive cost savings resulting from using MSC civilian crews versus Navy personnel continues to grow each

year, as the Military Sealift Command assumes more of the Navy's combat logistics role. In the next few years, MSC expects that trend to continue, as additional Navy resupply ships and missions are transferred to this command (Ref. 8). Most recently, the AOE class of regular Navy supply ships has been considered for transfer to the NFAF fleet.

The Prepositioning Program consists of 33 civilian-manned vessels and is the core element of the Navy's force forward strategy. The ships, listed in Chapter IV, are preloaded with military supplies to sustain forward deployed Army, Air Force, Navy, and Marine units, and are segregated into three divisions. Thirteen vessels constitute the Combat Prepositioning Force (CPF) and are deployed in the Arabian Gulf, the Indian Ocean, and the western Pacific. Designed to support Army missions, these ships carry enough combat material, food, water, and other essentials to sustain two Army heavy brigades, including 6,000 soldiers for 30 days. Another thirteen vessels make up the Maritime Prepositioning Force (MPF) that support a Marine Corps Air/Ground Task Force of up to 51,000 marines. They are prepositioned in the Mediterranean Sea, Indian Ocean, and the southwest Pacific. Finally, seven vessels comprise the Logistics Prepositioning Force (LPF) that serves Air Force, Navy, and Defense Logistics Agency needs. They include three Air Force precision munitions ships, three tankers carrying 600,000 barrels of oil, and one Navy field hospital (Ref. 9).

MSC, as the responsible agency for military sealift, gains operational responsibility over the Ready Reserve Fleet vessels after the Maritime Administration activates them. MSC is the government contractor when it comes to making contracts for sealift with commercial and foreign carriers. In addition to the sizable fleet they already manage, they have the sole responsibility for all sealift during a contingency. While they

are not directly involved with the issues regarding manning the RRF, they reap the end benefits or problems that may arise. Despite all of this, MSC has remained relatively detached from the industry as a whole. The command has not, and likely will not, take the lead in maritime issues, preferring to leave that to the commercial companies and unions.

C. MARITIME ADMINISTRATION

The Department of Transportation's Maritime Administration is the government's primary agency responsible for the American flag merchant marine. With the exception of licensing and shipboard inspections, MARAD is responsible for just about everything having to do with the maritime industry. Their mission states that the "overall mission of the Maritime Administration (MARAD) is to promote the development and maintenance of an adequate, well-balanced, United States merchant marine, sufficient to carry the Nation's domestic waterborne commerce and a substantial portion of its waterborne foreign commerce, and capable of serving as a naval and military auxiliary in time of war or national emergency." (Ref. 10)

Since MARAD was transferred from the Department of Commerce to the Department of Transportation in the 1980's, the more powerful aviation and land transportation constituencies have tended to overshadow it. Hence, until recently, MARAD had limited ability to influence the size of the merchant marine under U.S. registry (Ref. 2:p. 61) As mentioned earlier, the Maritime Security Act of 1996 created the Maritime Security Program (MSP) which charges MARAD with promoting a privately owned, U.S. registered, and U.S. crewed dry cargo vessel inventory that can

fulfill the national security requirements and remain competitive in world commerce (Ref. 11:p. 75). This program will be discussed in Chapter IV.

MARAD is also charged with ensuring that ports are efficient, shipbuilding and repair service are adequate, and intermodal water and land transportation systems are effective. They have done this through a program and initiative called the Maritime Transportation System (MTS). Extensive reports on the state of the MTS and the work being done to improve or preserve it have been published, and research is still ongoing. These reports can be found on the MARAD web site at www.marad.dot.gov/publications.

In order to maintain an educated maritime officer corps, MARAD operates the United States Merchant Marine Academy and provides funding assistance to six state maritime schools. The state maritime academy cadets can participate in the Student Incentive Payment (SIP) Program in which MARAD grants them \$3,000 annually to offset school costs. In return for this assistance, students are obligated to complete the academy's course of instruction, pass the Coast Guard examination for a merchant marine officer's license, maintain that license for at least six years, apply for an appointment as a commissioned officer in an armed forces reserve component for six years, and maintain employment in the maritime industry for at least three years after graduation (Ref. 12:p. 70).

MARAD also monitors the application of the Jones Act provisions, in cooperation with the U.S. Customs Service, and the cargo preference laws, both of which will be discussed in detail in the following Chapter. Finally MARAD is tasked with the acquisition, maintenance and manning of the National Defence Reserve Fleet, which consists of the Ready Reserve Force and the inactive fleet. As for manning and

maintaining the RRF, MARAD must rely on maritime unions to provide the mariners who fulfill these tasks. The role this agency plays in the industry is vital due to their responsibility for overseeing so many maritime policies and programs.

D. MARITIME SCHOOLS

The United States Merchant Marine Academy and the six state maritime academies provide the industry with new officers. Table 3 lists the approximate yearly graduates of each of the state schools and the Merchant Marine Academy (Ref. 13). On the unlicensed side, several union schools provide the training for the deck hands and enginemen, as well as courses to meet the Standards of Training and Watchkeeping which will be discussed later. One such school is the Harry Lundeberg School of Seamanship at the Paul Hall Center in Piney Point, Maryland operated by the Sailors International Union (SIU). As a side note, one of the most reputable engineering schools, the National Marine Engineers' Beneficial Association's (MEBA) Calhoon Engineering school discontinued their entry level curriculum in 1988 because of the decline in the industry and now only run a continuing education program (Ref. 14).

The level of education provided these mariners is one of the highest in the world. Unfortunately, with the decline of the merchant fleet and increasing draw of shore-side jobs, many graduates are not sailing after graduation; if they do sail, it is generally for a short time until they find a shore-side job. Very little effort is made to enforce the commitment to work in a maritime related field after graduation, especially at the U.S. Merchant Marine Academy. There are pending initiatives that would require Academy graduates to apply for a waiver from MARAD if they choose to work in the shore side

industry, in an attempt to force more graduates to go to sea. The other maritime schools have limited alumni tracking and are not able to produce statistics as to which of their graduates are currently sailing. To compound the issue, the schools producing the officers that man our fleet do not often cooperate with each other and, as with the unions, do not present a unified voice on maritime issues.

Maritime School	Qualified Graduates		
	1998	1999	2000
United States Merchant Marine Academy, Kings Point NY	Approximately 200	Approximately 200	Approximately 200
Maine Maritime Academy, Castine ME	176	176	176
Massachusetts Maritime Academy, Buzzards Bay MA	83	75	75
California Maritime Academy, Vallejo CA	51	66	61
State University of New York Maritime College, Throggs Neck NY	Not Available	Not Available	Not Available
Texas Maritime Academy, Galveston TX	33	35	25
Great Lakes Maritime Academy, Traverse City MI	23	26	21
*Paul Hall Center (SIU School for Seamen), Piney Point MD	4,000+	4,000+	4,000+
*The Paul Hall Center offers several approved courses for Able Body Seaman (AB) and Qualified Member of the Engine Department (QMED), as well as Third Mate, Third Engineer, Limited tonnage Third Mate and Third Engineer. The Center also provides most of the necessary courses to complete the Standards of Training, Certification and Watchkeeping requirements. Actual number of qualified graduates unavailable.			

Table 3. Maritime Schools and Recent Graduates

E. UNITED STATES COAST GUARD

The Coast Guard is the regulatory agency responsible for the safety of all United States vessels. Subsequently, they are responsible for determining all training

requirements, conducting all qualification testing and licensing for all mariners working on American waters. The U.S. Coast Guard (USCG) and the American Bureau of Shipping, the main classification society in the U.S. flag fleet, impose high safety standards on U.S. shipping companies. These standards are generally more stringent than those enforced on flag-of-convenience vessels. The U.S. Coast Guard is also responsible for implementing the new international convention on Standards of Training and Certification of Watchkeepers (STCW). The Coast Guard will administer the U.S. STCW, which far exceeds the minimum requirements of STCW required by the international convention and administered by the International Maritime Organization (IMO). Additionally, the international convention does not provide a mechanism to verify how a given country will administer or comply with STCW (Ref. 2:p. 178). This means that some countries may decide to meet only the bare minimum requirements of the agreement, while others, like the United States and the Netherlands, may go above and beyond the scope of the original STCW agreement.

As mentioned, the United States Coast Guard is the regulatory agency responsible for licensing and documenting all U.S. merchant mariners. As required by applicable laws, no one may be employed on a U.S. flag merchant ship of 100 gross tons or over without a merchant mariner document issued by one of the USCG Regional Examination Centers (Ref. 15).

While it serves a vital regulatory role in the maritime industry, the Coast Guard is not the industry's voice. The Coast Guard has many other duties, including law enforcement, safety inspections, and coastal defense. In actuality, the licensing department is a small part of the service and there is not enough interest, manpower or

reason for them to take a more active part in supporting the maritime industry. They support MARAD and have helped them with license data downloads to assist in determining the number of qualified mariners in the industry, but they have not taken an active role in lobbying for the maritime industry due to their many other responsibilities.

F. SHIPYARDS

As ships from the WWII surplus flooded the world ship market, and U.S. companies opted for flags of convenience, U.S. shipyards dwindled considerably in number and production of new vessels in the post-war period. As of 1999, there were 19 private shipbuilding and repair shipyards in the U.S., but only two were involved in constructing large oceangoing commercial vessels. Although more than 200 privately owned firms repair ships in the U.S., only 73 of these are capable of handling large vessels; of these, only 33 have dry docking facilities (Ref. 16:p. xiv). Not only have our shipyards declined in number, they have lost much of their skilled labor and expertise.

Were the nation forced to undergo a mass shipbuilding effort, such as occurred in World War II, it is unlikely that sufficient personnel could be found with the knowledge to mass produce vessels. The industry's thirty-year concentration on naval construction has diminished its commercial shipbuilding ability and posed a major challenge for reentering the international shipbuilding arena. While the quality of American-built vessels is among the highest in the world, there simply are not enough U.S. ships built to impact the industry. This situation, coupled with the high cost of unionized labor, makes shipbuilding in the U.S. much more expensive than overseas shipyards. According to the Department of Labor, the shipbuilding and repair industry employed 72,800 production

workers in mid-1998. Since the naval build up of the 1980s, 75,500 production jobs have been lost, a more than 50 percent decline (Ref. 17:p. 2). As a result, the shipyard lobby, while vocal and moderately organized, is too small to influence maritime reform.

G. MARITIME COMPANIES

There are approximately 40 different U.S. shipping companies operating America's deep-water fleet. There are also many smaller companies that own and operate the tugs, barges, and inland waterway vessels. These are a vital part of the industry. The ocean-going U.S. companies must choose between the restrictions posed by the U.S. policies and regulations described in this thesis or seek the benefits of a flag of convenience. Under a flag of convenience, shipping companies may not have to contend with deeply entrenched unions because they can hire freely with fewer restrictions and at lower wages. They may not have to contend with corporate and individual taxes or high insurance rates. In many cases, the only U.S. corporate or income taxes paid by foreign flag owners are taxes paid on their U.S. shore-based facilities and personnel, which are often non-existent. However, vessels operating under the U.S. flag are subject to all the taxes and regulatory laws applicable in the United States (Ref. 6:p. 7). The cost of acquiring and maintaining a ship for non-U.S. shipping companies is much lower at the shipyards of their choice. Safety requirements are still extensive, but not nearly as stringent. Hence, there are many areas where ships under flags of convenience can capitalize to improve their competitive edge and increase revenues.

The lawmakers and military planners are well aware of this issue and have taken steps to preserve a U.S. flag merchant fleet. Their latest efforts come in the form of the Maritime Security Act of 1996, which is discussed in the next chapter. Regardless, the maritime companies are key players in any further maritime reform.

H. MERCHANT MARINERS

The last group of concern, and one of the most important, is the merchant mariners who sail the ships in question. For the most part, highly educated and extensively qualified, United States sailors are some of the best in the world. Unfortunately, the glory days of being a merchant sailor are gone. The merchant mariner situation will be discussed further in Chapter VII.

IV. MARITIME POLICIES AND PROGRAMS

A. INTRODUCTION

With higher costs and cheaper foreign competition, why would any company still operate an American flagged vessel? Why does the fleet still exist under these conditions? Essentially, the only explanation is the government programs and laws that have been created to help sustain the industry.

B. PREVIOUS MARITIME POLICIES AND PROGRAMS

Maritime Policy has been a difficult issue for the government since the first Congress in 1789. Arguments abounded in the first Continental Congress about what to do with the hundreds of privateers flying the new American flag. But the heyday of modern policy began with the Merchant Marine Act of 1936. Prior to the Second World War, the government recognized the need to maintain a national flag fleet to avoid problems with sealift capabilities that occurred during World War I. With the increase in foreign competition, government assistance was necessary. The 1936 Act initiated several programs and policies to help defray the rising cost of flying the American flag.

One of the policies defined in the bill, cabotage, is still in effect and will be discussed later. Two sets of subsidy programs were also created: the Operational Differential Subsidy (ODS), and the Construction Differential Subsidy (CDS). The former program provided government money to American companies to defray the higher cost of operating a U.S. flag vessel while the latter compensated owners for ship

construction in costly American shipyards. The Act also began the Maritime Guaranteed Loan (Title XI) Program that helps the shipbuilding and repair industry obtain loans.

For nearly sixty years, the ODS program sought to equalize the disparity in operating costs between American-flag ships and foreign competitors, with respect to wages, insurance, maintenance and any repairs which were not compensated by insurance. As the years have gone on, studies have shown that despite subsidy payments totaling almost \$14 billion (Ref: 12:p. 92), both CDS and ODS have failed to substantially halt the decline of the merchant fleet. Appendix B lists the subsidy amounts paid to maritime companies and shipyards, from the program's inception in 1936 to 1999. Despite the large subsidies, which varied from under a million dollars to almost four million dollars for a single ship, there was no real incentive for a company to maintain its fleet under the American flag. Seen as more failed maritime policy, lawmakers were actively searching for ways to stop this apparently futile outflow of cash.

CDS was the first of these two subsidies to get slashed during the budget-cutting era of the early 1980s. President Reagan eliminated the CDS in 1981. The Maritime Security Program, a new program that will be discussed later, was created in part to eventually replace ODS. No new ODS contracts have been approved since 1981. However, it is still an active program with fiscal year 1998 subsidies equaling approximately 137.7 million dollars. The last ODS subsidy will expire in October of 2001 (Ref. 18:p. 10). As a side note, the law required that every vessel receiving an ODS must be enrolled in the Sealift Readiness Program (SRP). The SRP is the precursor to the Voluntary Intermodal Sealift Agreement and will be discussed in chapter six (Ref. 19:p. 15)

Neither the ODS or the CDS subsidies provided an incentive for the companies to maintain their vessels under the U.S. flag. Both of the subsidies merely defrayed the additional costs of maintaining registry in the United States. Companies not involved in coastwise trade subject to the laws of cabotage, had little reason to struggle making ends meet, even with the subsidies, when they could cut their costs tremendously by going foreign flagged.

C. MARITIME SECURITY PROGRAM AND VOLUNTARY INTERMODAL SEALIFT AGREEMENT

The latest government attempt to actually provide an incentive to save the merchant fleet comes through the Maritime Security Act of 1996. This relatively new legislation is a ten-year program designed to ensure the existence of military sealift capabilities in case of a conflict. Military leaders discovered the hard way in Operations Desert Shield/Desert Storm how important sealift capability was to overall military readiness. The sheer volume of cargo that was required to be moved by sealift reinforced the value of the merchant marine industry in all of the military leadership's minds. VADM Francis Donovan, a former Commander, Military Sealift Command stated "From a sustainability viewpoint, we need both a capable Ready Reserve Force and a strong, active merchant marine; the former to provide the surge movement of equipment and the latter to move the follow-on sustaining cargo and supplies.... This capability could be jeopardized if the U.S.-flag fleet continues to decline." (Ref. 20)

With the decline of the American flag merchant marine, the capacity available to transport military forces and meet the military's sealift requirements dramatically declined. In an effort to stop this trend, several programs were created, including the

Voluntary Intermodal Sealift Agreement (VISA) under the aegis of the Maritime Security Program (MSP). Without the MSP, American President Lines and Sea-Land, America's two largest commercial carriers, would have been forced to reflag a number of their ships to foreign countries. These two companies represent 85 percent of the deep-sea ship capacity in the U.S. Merchant Marine (Ref. 21).

VISA was created after passing the Maritime Security Act of 1996, and modeled after USTRANSCOM component Air Mobility Command's Civil Reserve Air Fleet (CRAF) program. As with CRAF, ships that enroll in VISA obtain preference for peacetime government cargoes before other U.S.-flag companies. In return for this, they are required to donate a certain percentage of their capacity to the Department of Defense in time of crisis. There are varying stages of VISA, with Stage III being at least 50% of the capacity. VISA is only activated after the supply of U.S. government owned ships, such as the Military Sealift Command and Maritime Prepositioning Ships, have been exhausted and after U.S. and foreign flag shipping firms have reached their limit for voluntary contracting (Ref. 21). If the VISA program is activated, the carriers are compensated at a fair market rate for the government cargo they transport. Since VISA is capacity orientated, shipping companies can combine military cargos with other trade, as well as use agreements with other shipping firms. Even if those other firms are foreign flag or not VISA participants, the agreements can be used to meet VISA commitments. Table 4 below lists the current VISA program participants (Ref. 23).

Alaska Cargo Transport, Inc.	Donjon Marine Co., Inc.*	Matson Navigation Company, Inc.	Sea Trader Co.*
American Automar, Inc.	Double Eagle Marine, Inc.	Maybank Navigation Company, LLC	Signet Maritime Corporation*
American President Lines, Ltd.	E-Ships, Inc.	McAllister Towing and Transportation Co, Inc.	Smith Maritime
American Roll-On Roll-Off Carrier, LLC	Farrell Lines Incorporated	Moby Marine Corporation	Stea Corporation*
American Ship Management, LLC†	First American Bulk Carrier Corp. †	Moran Towing Corporation*	Stevens Towing Co., Inc.
Automar International Car Carrier, Inc. †	First Ocean Bulk Carrier-I, LLC†	NPR, Inc.	Superior Marine Services, Inc.
Beyel Brothers Inc.	First Ocean Bulk Carrier-II, LLC†	Ocean Marine Shipping, Inc.*	Totem Ocean Trailer Express, Inc.
Central Gulf Lines, Inc. †	First Ocean Bulk Carrier-III, LLC†	Odyssea Shipping Line LLC*	Trailer Bridge, Inc.
Columbia Coastal Transport, LLC*	Foss Maritime Company	Osprey Shipholding Corporation, LLC	TransAtlantic Lines, LLC
Cook Inlet Marine	Gimrock Maritime, Inc.	Resolve Towing & Salvage, Inc.	Trico Marine Operators, Inc.
Crowley American Transport, Inc.	Liberty Shipping Group Limited Partnership	Samson Tug & Barge Company, Inc.	Troika International, Ltd.
Crowley Marine Services, Inc.	Lockwood Brothers*	Sea Star Line, LLC*	U.S. Ship Management, Inc. †
CSX Lines, LLC	Lykes Line Limited, LLC	Seacor Marine International Inc.	Van Ommeren Shipping (USA) LLC
Dixie Fuels II, Limited	Lynden Incorporated	Sealift Inc.	Waterman Steamship Corporation†
* Indicates newly approved	Maersk Line, Limited†	SeaTac Marine Services*	Weeks Marine, Inc.
† Indicates MSP Participant			

Table 4. VISA Participants as of 2001

VISA is activated at the request of the Commander in Chief, United States Transportation Command (USCINCTRANS), with the approval of the Secretary of Defense. Stage I is activated in whole or in part when voluntary capacity is determined to be insufficient to meet contingency sealift requirements. Stage II is activated, in whole or in part, when the sealift requirements exceed the capability of Stage I (15 percent of participant capacity). Stage III is activated when both Stage I and Stage II (40 percent of the participant capacity) are insufficient to meet the contingency sealift requirements. Stage III activation requires 50 percent of the participant vessel's capacity, except for those vessels enrolled in the Maritime Security Program. (Ref. 23:p. 27) Appendix C gives a graphical representation of this process (Ref. 24).

In order for a vessel to qualify for the Maritime Security Program, the ship must enroll in VISA for 100% of their capacity. In other words, should Stage III of VISA be activated, the entire vessel's capacity must be available to the Department of Defense. The specific ship itself is not required to cease operations and return to port to load military cargo, rather the company that operates it must make an equivalent amount of cargo space available to the military, even if it is on a foreign flag vessel. In return for this commitment, all MSP vessels are given a subsidy of \$2.1 million per vessel per year for ten years. The Program supports up to 47 vessels; currently there are 47 ships enrolled from ten different companies. Table 5 lists the current vessels enrolled in the program and their cargo capacity (Ref. 25).

<i>Contract No.</i>	<i>Vessel Name</i>	<i>Company</i>	<i>Gross Tonnage</i>	<i>Deadweight Tonnage</i>	<i>Cargo Capacity</i>	<i>Start-Up Date</i>
MA/MSP-1	APL KOREA	ASM	64502	66520	4832 TEU	Dec 97
MA/MSP-2	APL PHILIPPINES	ASM	64502	66520	4833 TEU	Jan 98
MA/MSP-3	APL SINGAPORE	ASM	64502	66520	4834 TEU	Dec 97
MA/MSP-4	APL THAILAND	ASM	64502	66520	4835 TEU	Dec 97

MA/MSP-5	PRESIDENT ADAMS	ASM	61926	54700	4340 TEU	Nov 97
MA/MSP-6	PRESIDENT JACKSON	ASM	61926	54700	4341 TEU	Nov 97
MA/MSP-7	PRESIDENT KENNEDY	ASM	61926	54700	4342 TEU	Nov 97
MA/MSP-8	PRESIDENT POLK	ASM	61926	54700	4343 TEU	Nov 97
MA/MSP-9	PRESIDENT TRUMAN	ASM	61926	54700	4344 TEU	Nov 97
MA/MSP-10	GREEN COVE	Central Gulf	50308	16178	5150 CARS	Jun 00
MA/MSP-11	GREEN POINT	Central Gulf	51819	14830	4119 CARS	Apr 98
MA/MSP-12	GREEN LAKE	Central Gulf	47307	14104		Dec 96
MA/MSP-13	FAUST	AICC	51858	28070	6380 CARS	Sep 99
MA/MSP-14	FIDELIO	AICC	47219	15681	5574 CARS	Sep 99
MA/MSP-15	TANABATA	AICC	49443	20082	5856 CARS	Nov 99
MA/MSP-16	CHESAPEAKE BAY	FABC	31920	36003	2409 TEU	Jan 99
MA/MSP-17	DELAWARE BAY	FABC	31920	36003	2410 TEU	Jan 99
MA/MSP-18	ENDEAVOR	E-Ships	31487	71873	TANKER	Jul 00
MA/MSP-19	ENDURANCE	E-Ships	20987	22041	1476 TEU	Jul 00
MA/MSP-20	ENTERPRISE	E-Ships		35012	1400 TEU	Jul 00
MA/MSP-21	LYKES NAVIGATOR	FOBC	39132	44966	3026 TEU	Jul 98
MA/MSP-22	LYKES DISCOVERER	FOBC	39132	44966	3027 TEU	Jul 98
MA/MSP-23	LYKES LIBERATOR	FOBC	39132	44966	3028 TEU	Jul 98
MA/MSP-24	MAERSK CALIFORNIA	Maersk	20842	28550	1400 TEU	Apr 97
MA/MSP-25	MAERSK COLORADO	Maersk	20842	28550	1401 TEU	May 97
MA/MSP-26	MAERSK TENNESSEE	Maersk	20842	28550	1402 TEU	Mar 97
MA/MSP-27	MAERSK TEXAS	Maersk	20842	28550	1403 TEU	Feb 97
MA/MSP-28	OVERSEAS JOYCE	OSG	48017	16141	5300 CARS	Dec 96
MA/MSP-29	SEALAND ACHIEVER	USSM	57075	58869	4258 TEU	Dec 99
MA/MSP-30	SEALAND FLORIDA	USSM	57075	58869	4259 TEU	Dec 99
MA/MSP-31	NEWARK BAY	USSM	57075	58869	4260 TEU	Dec 99
MA/MSP-32	SEALAND OREGON	USSM	57075	58869	4261 TEU	Dec 99
MA/MSP-33	SEALAND COMMITMENT	USSM	57075	58869	4262 TEU	Dec 99
MA/MSP-34	SEA-LAND ATLANTIC	USSM	57075	58869	4263 TEU	Dec 99
MA/MSP-35	SEA-LAND DEFENDER	USSM	32629	30225	2472 TEU	Dec 99
MA/MSP-36	SEA-LAND ENDURANCE	USSM	32629	30225	2473 TEU	Dec 99
MA/MSP-37	SEA-LAND EXPLORER	USSM	32629	30225	2474 TEU	Dec 99
MA/MSP-38	SEA-LAND INNOVATOR	USSM	32629	30225	2475 TEU	Dec 99
MA/MSP-39	SEA-LAND INTEGRITY	USSM	57075	58869	4258 TEU	Dec 99
MA/MSP-40	SEA-LAND LIBERATOR	USSM	32629	30225	2475 TEU	Dec 99
MA/MSP-41	SEA-LAND PATRIOT	USSM	32629	30225	2476 TEU	Dec 99
MA/MSP-42	SEA-LAND PERFORMANCE	USSM	57075	58869	4258 TEU	Dec 99
MA/MSP-43	SEA-LAND QUALITY	USSM	57075	58869	4258 TEU	Dec 99
MA/MSP-44	GREEN ISLAND	USSM	28580	46153	89 LIGHTERS	Feb 97
MA/MSP-45	ROBERT E. LEE	Waterman	28580	46153	90 LIGHTERS	Mar 97
MA/MSP-46	SAM HOUSTON	Waterman	28580	46153	91 LIGHTERS	Apr 97
MA/MSP-47	STONEWALL JACKSON	Waterman	28580	46153	92 LIGHTERS	Mar 97
TOTAL TONNAGE AVAILABLE - MSP			1,072,550	1,196,034		

Table 5. MSP Vessels as of July 2000

Compared to the previous ODS, the MSP subsidy is less than half the cost. This was done as an incentive for companies to increase efficiency and reduce costs. Essentially, the ODS contracts as of FY1995 supported 59 American-flag ocean going liners at a cost of \$216 million. Comparatively, the MSP contracts support 47 vessels with a maximum cost of \$100 million a year. Additionally, ODS contracts required ships to operate on specific shipping routes, not allowing the company to shift ships to adjust to the market. The MPS subsidies do not have these restrictions and give the shipping firms additional flexibility to maximize their resources. With the exception of the remaining ODS contracts, the MSP is the only remaining government subsidy given specifically to maintain the maritime fleet. One point of concern with the program, however, is that the funds to pay the subsidy must be approved every year and there is no guarantee that all or any substantial portion of the authorized sum will actually be spent as intended in the act (Ref. 26).

D. CARGO PREFERENCE LAWS

One of the most obvious methods to maintain a fleet of American flag vessels is to guarantee a level of business through the government. This is done through a series of Cargo Preference Laws. The Maritime Administration (MARAD) defines Cargo Preference as "the reservation, by law, for transportation on U.S. flag vessels, of all or a portion of all ocean borne cargo which moves in international trade either as a direct result of the Federal Government's involvement or indirectly because of the financial sponsorship of a Federal program or guarantee provided by the government." (Ref. 27)

In other words, the government insures a certain amount of business for U.S. flag vessels. Guaranteeing business also guarantees profit.

This policy officially began with the Cargo Preference Act of 1904, which required that all items procured for or owned by the U.S. military departments and defense agencies be carried exclusively on U.S. flagged vessels. Subsequently, the Cargo Preference Act of 1954 required at least 50 percent of the gross tonnage of all Government-generated cargo be transported on private U.S. flag vessels, to the extent such vessels are available at fair and reasonable rates. The latest change to these laws came in 1985 with an amendment to the Merchant Marine Act of 1936, which increased the percentage of certain agricultural goods carried on U.S. carriers from 50 to 75 percent (Ref. 5:p. 12).

Even though Cargo Preference laws add an estimated 51 percent to the cost of transporting government goods, or approximately \$578 million above the lowest cost carrier between 1989 and 1993 (Ref. 5:p. 20), its value to the merchant fleet is somewhat difficult to dispute. Even though the exact numbers vary according to the source, these preference laws can be credited with spending over \$3.5 billion between FY89 and FY93 shipping goods on American flag carriers. Policy opponents cite the additional cost as being unnecessary and wasteful. While cargo preference laws have not significantly affected the fleet's share of international freight, data suggests that an estimated two-thirds of the fleet would re-flag or cease operating if these laws were to be repealed. The General Accounting Office (GAO) November 1994 report, *Cargo Preference Laws- Estimated Cost and Effects*, contains impressive figures. GAO estimated that without cargo preference laws, the U.S. flag fleet would lose 81 percent of all general cargo

vessels, 90-96 percent of all bulk carriers, 38-45 percent of all tankers, and 77-86 percent of the high value intermodal vessels. With all these re-flaggings, approximately 71 percent of all maritime sailing jobs would disappear (Ref. 28:p. 25-32). The effects of that on the military's sealift capability would be absolutely devastating.

E. JONES ACT AND CABOTAGE

The last major policy is cabotage. Originating from the French word "to sail along the coast," cabotage requires that all cargo being transported from one domestic port to another must be carried on an American flagged vessel. This is by far the oldest maritime policy. Cabotage has been common law and practiced since the First Congress in 1789, when registration was restricted for coastal trades and fisheries to U.S.-built and U.S.-owned vessels, and these vessels received preferential treatment with respect to tonnage taxes and cargo import duties (Ref. 28). Over forty other nations have cabotage laws including Japan, Canada, Germany, Greece, Italy, and Spain. Cabotage became an official law with the 1920 Merchant Marine Act, which stated that cargo transported entirely or partly by water between U.S. ports must travel in U.S. built, U.S. citizen owned vessels that are documented by the U.S. Coast Guard for such traffic. Commonly recognized as the Jones Act after its sponsor, Senator Wesley Jones of the Commerce Committee, the law has been widely regarded as one of the most important, and controversial, maritime policies (Ref. 29:p. 21).

Cabotage is a requirement to operate on certain shipping routes. The value of the Jones Act fleet and the routes they serve is impressive. In 1998, over 8 million passengers and 1 billion tons of cargo, valued at \$222 billion, were transported over

routes subject to the Jones Act (Ref. 30:p. 38). These trade routes are essentially guaranteed, with no foreign competition allowed. Even with the guarantee of business, shipping firms must find ways to increase efficiencies and cut costs to compete with the other Jones Act vessels. Additionally, Jones Act vessels are not eligible to receive ODS or Maritime Security Program subsidies. Nevertheless, over 75 percent of the Jones Act fleet is militarily useful and represents 30 percent of all VISA capacity (Ref. 31). Without the Jones Act, undoubtedly much of the current U.S. flag fleet would quickly go out of business or reflag due to cheaper foreign competition. Table 6 lists the number and tonnage of the Jones Act fleet (Ref. 32).

Vessel Type	Ships	Gross Registered Tonnage	Deadweight Tonnage
Tanker	109	4286	7625
Dry Bulk Carrier	3	55	89
Full Container	25	548	598
Roll-On/Roll-Off	13	377	239
Cruise/Passenger	1	20	7
Freighter	2	32	45
Total	153	5318	8603

Table 6. Privately-owned self-propelled Merchant Vessels with Unrestricted Domestic Trading Privileges (Jones Act) Vessels of 1,000 GRT and above as of July 1, 2000 (Tonnage in Thousands)

F. POLICY AND PROGRAM CONTROVERSY

As with all U.S. Government programs and policies, the country's maritime policy has its supporters and opponents. The pros and cons of each and every policy

causes debate across the country. This makes any attempt at Maritime Policy reform a difficult to nearly impossible political task. Farmers are some of the most vocal opponents of current policy, specifically the Jones Act and cargo preference. They argue that these laws force them to pay a higher price for transporting their goods and therefore prohibit them from competing on a global level. The American Farm Bureau Federation is one of the largest anti-cabotage and anti-cargo preference lobbies. They view these policies as "prime examples of intrusive government regulation of an industry that should be allowed to function according to market forces and has failed to compete because the government has provided a monopoly that shelters it from market competition." (Ref. 33) While this position can be challenged, it is representative of the controversial nature of maritime policy. Even the MSP has its opponents. Specifically, opponents point out that many of the MSP vessels may be registered in the United States, but they are actually run by foreign companies through an American subsidiary. Does this matter? Some people feel that the U.S. government is essentially subsidizing a foreign company. The debates on these policies are complex, controversial, and could each fill their own thesis.

These policies have become very controversial subjects, with many claiming that they do more harm than good. So the bottom line seems to be what can be done to maintain our American-flag merchant fleet? Do the current policies provide enough incentives to the shipping companies? The current trends show the number of ships in the fleet leveling out, even as the tonnage capacity increases. So the policies have apparently been able to marginally stem, or slow down, the industry's demise. Any future policies, however, will have a very difficult time passing Congress. It is unlikely that the American-flag fleet will ever be as strong as it was after World War II, but as

long as cargo preference guarantees cargo, the Jones Act guarantees routes for U.S. registered ships only, and programs such as VISA and MSP provide an option and incentive for maritime companies to maintain American-flagged vessels, our merchant marine will limp along. The Maritime Security Act of 1996 was a good step toward future policy, linking the fleet to national security needs.

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V. ANALYZING THE UNITED STATES MARITIME

A. INTRODUCTION

The object of this research is to determine whether or not there are enough merchant mariners to respond to a national contingency. However, this thesis would be of little value without at least identifying and analyzing the factors that made the condition of the U.S. maritime industry an issue of concern. To this end, the systems model was effective in laying out the myriad of elements that make up this complex topic in a more tangible and manageable context. The next paragraph briefly describes the systems model. This is followed by applying the systems model to the U.S. maritime industry, which shows that the greatest problem is perhaps in the input block of the systems model, specifically in the critical element of direction setting policy. With policy identified as a major source of the problem, the chapter proceeds with the process of policy analysis.

B. THE SYSTEMS MODEL

The systems model used in this chapter is a cause and effect model that can be traced to the Model for Analyzing Work Groups developed by Michael B. McCaskey (Ref. 34). Dr. Nancy C. Roberts evolved McCaskey's model into the Organizational Systems Framework.¹ The latter makes it possible to take very complex organizations and break them down into three basic internal elements: inputs, throughputs and results.

¹ Dr. Nancy C. Roberts is a Professor at the Naval Postgraduate School in Monterey, CA. She uses the Organizational Systems Framework as part of an Organization and Management Course but has not published a work that includes this model.

Inputs are factors that provide system direction. Throughput includes design factors composed of tasks, technologies, structure, people and processes/subsystems. Results consist of culture, outputs and outcomes. Finally, the internal system itself is responsive to the external environmental context. With all the elements and factors plotted in the model, it is possible to trace how inputs and throughput affect the results. It is important to recognize that although changes can be applied directly to the inputs and throughput elements, the culture, outputs or outcomes in the results element cannot be changed directly. To effect changes in the result element, it is necessary to make them indirectly via the inputs and throughputs. For a graphic representation of this model see Appendix D. It is also important to note that the systems model in this case is not used to analyze one organization. Instead, the model is modified slightly to analyze multiple organizations as they impact the U.S. maritime industry.

C. THE MARITIME INDUSTRY IN THE SYSTEMS MODEL

As one dives into the maritime field, it is relatively easy to drown in the magnitude and complexity of the challenges that affect the U.S. Merchant Marine. However, the underlying questions about the causes for its decline are helpful in that they point to a cause and effect problem. Hence, in laying out and tracing the maritime dilemma, a systems approach is appropriate because of its "cause and effect property." Appendix E is a basic layout of the systems model applied to the maritime industry, showing the environment/context, the inputs, throughput or design factors, and results in terms of culture, outputs and outcomes. The following paragraphs examine these elements and factors with more detail.

1. Environment/Context

The environment with which the U.S. Merchant Marine must contend is determined by political, economic, and social/cultural forces. In the political arena, the President of the United States formulates National Security Strategy in response to perceived threats. Congress makes laws in response to the President's strategy, interest groups such as unions, and others such as environmental groups. The state of the economy has effects on trade and manpower while the social/cultural settings of the general public determine the level of support and commitment to the maritime industry. Although these are external to the system, they play a major role in influencing inputs, throughput and therefore results.

2. Key Success Factors

Historically, the rise and fall of maritime nations has always been correlated with commercial and military command of the sea. These maritime nations were committed to sea power at the highest levels of their political system. A strong military is necessary to enforce foreign policy and protect national interests anywhere on the globe. An efficient and effective maritime industry is essential if America is to secure its fair share of world trade and ensure its capability to respond to surge requirements in the event of a national emergency. Efficiency and effectiveness can only be achieved through collaboration of all the stakeholders in the system.

3. System Direction

Direction refers to policy as delineated by visions, missions, goals, strategies, laws and regulations derived from the President, Congress and other organizations. In the context of this thesis, it is necessary to start with the President's National Security Strategy, which states:

Taking account of the realities of the post-Cold War era and the new threats, a military capability appropriately sized and postured to meet the diverse needs of our strategy, including the ability, in concert with regional allies, to win two nearly simultaneous major regional conflicts. (Ref. 35:p. 29)

This military capability depends heavily on maritime assets for projecting and sustaining forward deployed forces, but this national strategy does not mandate policies that ensure a merchant marine capable of supporting military requirements. Documents such as the military's Joint Vision 2010/2020 also emphasize military capability and readiness, but do not directly address the maritime industry. Legislation as early as the Merchant Marine Act of 1920 and as recent as the Maritime Security Act of 1996 is specific about promoting a merchant marine that can fulfill national security requirements and remain competitive in world commerce. Nevertheless, the present condition of the maritime industry suggests that these policies have not been effective.

4. Throughput – Design Factors

As mentioned before, the systems model is normally used to analyze one organization. In such a model, the design factors are all working together to fulfill a common vision and mission. In this case, however, the design factors are components from many organizations that are not necessarily working in the same coordinated direction. The following paragraphs touch briefly on these design factors, which are discussed in greater detail during the analysis.

The "People" category includes personnel who perform maritime related "Tasks" in the private or government sectors. Merchant mariners are depended upon to man the merchant fleet and respond to contingency surge requirements. Other people and their tasks include: shipping companies own the ships and run the shipping business;

shipyards build and repair ships; unions control jobs and manpower, and exercise collective bargaining with shipping companies; the U.S. Coast Guard enforces maritime safety standards and regulations; Congress makes maritime policy; DoD establishes sealift requirements for national security strategy; MARAD is charged with maintaining a strong merchant marine. There are many other organizations associated with the maritime industry, but only those with the greatest impact in the systems framework are mentioned here.

With so many organizations making up the mechanics of this system, the resulting business "Process" is one that can be bureaucratic, political, uncooperative, and competitive. While each organization attempts to reach its internal goals, the overall "Structure" can be said to be disjointed and complex in the overall framework, which should be heading in a direction that promotes a strong maritime that can fulfill national strategy.

The lower costs of operating under a foreign flag of convenience make it difficult for U.S. shipping companies to stay competitive. This contributed to the decline in the size of the U.S. maritime industry as ship owners opted for open registry countries (Ref. 1:p. 25). "With reduced activity, U.S. yards lost their economies of scale and became less up to date" (Ref. 2:p. 61). Hence, there is little incentive to invest in research and development. Thus, the U.S. maritime industry is not making significant progress in the area of "Technology." Therefore, it can not leverage innovation to improve its competitive edge.

5. Results

While much has been said to express concern for the U.S. maritime industry, it seems that the "Culture" is apathetic. Although instability in global politics can involve the U.S. in two nearly simultaneous major theater wars, there seems to be no real sense of urgency towards seriously tackling maritime concerns that are crucial to the nation's ability to handle these wars. Thus, the "Output" of this entire system appears to be a declining maritime capability and uncertainty about mariner availability. The "Outcome" then is uncertainty about the U.S. Merchant Marine's ability to fulfill surge requirements and sustain forward-deployed forces during a contingency.

Stepping back to view the overall systems model, it is evident that change in the results is necessary. However, the results cannot be changed directly. This leaves input and throughput as areas where changes can be applied to effect changes in the results. The throughput is too intricate and includes so many organizations that applying change to one would necessitate well-coordinated changes in all for a successful result. This being the case, change in the input element is necessary to realign the design factors in the throughput and thus, lead them in the same direction. In returning to the input element, it becomes evident that policy has not managed to stop the decline of the U.S. Merchant Marine. This calls for a closer look at maritime policy. The details of the flaws in maritime policy are best explained in the process of policy analysis below.

D. THE PROCESS OF POLICY ANALYSIS

As the systems model revealed, a close examination and analysis of maritime policy may provide the true source of the issues that endanger the U.S. maritime industry

and identify some alternatives to deal with these problems. The five stages of "The Process of Analysis" from E.S. Quade's "Analysis for Public Decisions" (Ref. 36) are used here because their properties lend themselves to look at the problem as a whole.

These five stages are as follows:

1. Formulation is helpful in clarifying and determining the objective
2. Search facilitates identification, designing and screening of alternatives
3. Forecasting takes into account the predicted future environment
4. Modeling assists in determining impacts
5. Synthesis provides for comparing and ranking alternatives (Ref. 36:p. 49)

The following paragraphs cover these five steps through the process of policy analysis.

1. Formulation – Clarifying the Problem and Determining the Objective

On the surface, the problem of the decline in the U.S. Merchant Marine could easily be identified as a shortage of ships and mariners, but several issues must be addressed to legitimize and clarify the problem. First, why is this shortage an important issue?

The United States is committed to protecting its interests and those of its allies. This commitment calls for a military capability that depends heavily on sealift to project its power anywhere in the world. Hence, this military capability must draw from the nation's maritime assets to transport the troops and military cargo necessary during a national crisis. In turn, maritime assets are composed of Navy assets as well as civilian ships and mariners. The Pentagon's Four Pillars of Military Capability include:

- Force Structure: the number, size and composition of military units.
- Modernization: the technical sophistication of the forces, weapon systems, and equipment.

- Sustainability: the "staying power" of the forces measured in days.
- Readiness: the immediate ability to execute a designated combat mission.

(Ref. 37:p. 3)

Readiness and sustainability may be at stake because the military's immediate ability to execute a designated combat mission, and its staying power, may be hindered if there are not enough ships or crews to transport the military cargo necessary to support military operations.

Next, it is essential to look beyond the obvious to identify the causes of the problem at hand. The discussion below does not dwell on the details of how each organization conducts its business, as this was covered in Chapter III. Rather, its focus is on how these organizations influence and respond to policy, and how the overall process of interacting with each other and the external environment affects them.

a. Labor Unions and Merchant Mariners

Unions are organized with the intent of protecting mariners from unfair business practices. And while the power of collective bargaining is essential to negotiate fair wages, ensure job security, and maintain safe working conditions, the nature of the maritime industry may cause unions to take self-defeating actions.

The context within which maritime industrial relations occurs has been most influenced by two things. The first is the operation of the national maritime policy. One of its effects has been a chronically declining shipping industry after each war-induced expansion. The other is the operation of union hiring halls. Together they have encouraged the development of the labor unions to which control of seagoing jobs are critical. (Ref. 38:p. 103)

The unions establish contracts on jobs with the shipping companies. Union members share these jobs through a rotation system. But as the ratio of mariners to jobs increases, the time each mariner can sail is decreased. And as the employment opportunity decreases, so does job satisfaction. Thus mariners judge the performance of their unions primarily on their ability to control jobs. While unions do not compete for members, the competition over jobs has made them long-standing rivals (Ref. 38: p. 104).

Furthermore, the need to maintain a certain mariner for job ration causes unions to limit membership, which has other implications. First, the maritime academies and union schools produce approximately 3,770 officers per year, but because of the need to protect about 9,300 ocean-going jobs for approximately 21,000 mariners competing for these jobs (Ref. 39:p. 105), only a few may enter the union. Most of them must find other maritime related jobs ashore.

The following is an example of how union efforts to support protection of coastal shipping under the Merchant Marine Act of 1920 (Jones Act) also had a negative impact. In 1980s, U.S. Northwest lumber producers were shipping little to no lumber by water because they were unable to compete with Canadian lumber producers who could ship their product to U.S. ports at much lower international freight rates. When the Northwest lumber producers lobbied Congress for a waiver of the Jones Act, U.S. Southeast lumber producers, U.S. flag shipping companies and labor unions were able to sway Congress not to act. "One estimate has put the U.S. welfare loss due to Jones Act restrictions on these lumber shipments at \$12 - 13 million per year" (Ref. 40:p. 79). It is likely that other industries suffer in the same manner.

Shipping companies may not be allowed to operate at their maximum efficiency because unions set manning requirements that are higher than needed to operate ships efficiently. Since working at sea involves a certain amount of risk and high skills, labor unions also bargain for wages that will compensate crewmembers for the risk they take and their skills. However, crew costs (pay, benefits, litigation costs, etc.) may account for as much as 50 percent of a ship's operating cost (Ref. 2:p. 102). The largest U.S. to foreign operating differential involves total crew costs (Ref. 29:p. 24).

Labor unions' ability to picket a ship or ships can quickly result in sizable losses to shipping companies. "In fact, new high-cost, highly productive ships are especially vulnerable to the disruptions caused by work stoppages. As capital-intensity increases, each striking seaman idles that much more capital" (Ref. 38:p. 131). While the actions of the unions are rational in that they take the necessary action to protect the member's interests, these actions may have negative consequences on the shipping companies.

The combined impact of the above contribute to the forces that drive U.S. shipping companies to foreign flags of convenience, where they are free to hire only the sailors they need to operate efficiently and pay at a much lower wage rate. This in turn reduces the number of sailing jobs, forcing unions to limit membership even more.

b. Congress

According to one source, the policies that United States has pursued with respect to the shipping industry have had a several objectives:

Maintaining a defense capability and the role of the U.S. Merchant Marine in future military actions;

Maintaining a viable shipbuilding industry (again, because of defense concerns);

Promoting U.S. trade generally;

Avoiding monopolization of the shipping industry by foreign carriers;

Offsetting other governments' subsidies to foreign carriers;

Offsetting the low wages paid by foreign carriers;

Improving the U.S. balance of payments; and

Contributing to U.S. economic growth and job creation. (Ref. 40:p. 29)

However, even with these goals, it appears that the Congress of the United States has been unable to make policy that is conducive to a prosperous merchant marine. In 1985, the National Advisory Committee on Oceans and Atmosphere stated in a special report to the President and the Congress: "The 'system' of laws and Federal programs related to marine transportation is not working" (Ref. 41:p. 67). In 1998, a former Maritime Administrator and Assistant Secretary of Commerce for Maritime Affairs stated that "much of the United States' maritime policy is at odds with that of other developed nations" (Ref. 42:p. 69).

At least part of the reason for Congress' failure to make better policy may be attributed to pressure from interest groups, as in the lumber producers example above. Further evidence of this was manifested when the National Performance Review under the Clinton Administration enacted its pledge to reduce the national deficit and improve government efficiency.

As part of its mandate, it investigated various forms of maritime subsidies and protection and eventually proposed their elimination. When this portion of the report was leaked, however, there was an outcry from maritime labor leaders, who had given President Bill Clinton considerable support during his election campaign. (Ref. 42:p. 69)

Thus, the plan was abandoned and later the administration introduced the Maritime Security Program. However, this program has been criticized because, "The program will allow American ship owners to continue to absorb unrealistically high labor costs and defray the expense of some of the government restrictions, but it contains no incentive for future U.S. Flag operations." (Ref. 42:p. 69).

Congress is reactive as it creates maritime laws. An example of this came about as a result of the Exxon Valdez oil spill. The Oil Pollution Act of 1990 called for double hull construction of all tanker ships operating in the U.S. exclusive economic zone and also increased owner liability to \$1,200 per gross or to \$10,000,000 for vessels over 3,000 gross tons, whichever is greater. This law also allows states to enact liability programs that are more stringent than federal legislation. "The potential for considerable financial risks and the requirements to use double hull vessels have caused some foreign flag companies, such as Shell, to stop operating their tankers in U.S. waters" (Ref. 2:p. 174-175).

These are but a few examples of legislation which make it more difficult for U.S. shipping companies to compete with foreign companies. Policies with similar consequences are addressed in the paragraphs that follow.

c. United States Coast Guard and American Bureau of Shipping

The U.S. Coast Guard gives navigational safety and protection of the environment a high priority. However, it allows foreign ships that meet International

Maritime Organization (IMO) standards to enter U.S. waters, while imposing stricter safety standards on U.S. flag ships (Ref. 42:p. 69). An example of this is the new Standards on the Training and Certification of Watchkeepers (STCW). Although this is in accordance with the IMO convention, the Coast Guard will administer the U.S. STCW, whose provisions exceed the minimum requirements of STCW required by IMO. Additionally, the IMO agreement does not provide a mechanism to verify if the country that issues a license complies with STCW. Since open registry flag's law enforcement is often nonexistent (Ref. 2: p. 178-179), there is concern that the U.S. merchant marine again is incurring higher costs as a result of standards that might not be enforced for some shipping companies under open registry.

The American Bureau of Shipping (ABS) is a classification society that holds high standards for structure and equipment of U.S. flag-ships. ABS also assesses the quality of a company's management structure, as required by the International Safety Organization (ISO)-900 guidelines. Nevertheless, ISM approval for some foreign flag vessels is obtained through their own classifications societies, some of which are of questionable reputation (Ref. 2:p. 178-179). Again, the cost for this certification may be higher for U.S. ships relative to some open registry vessels.

d. Shipyards

As the number of U.S. flag ships have dwindled, so have shipyards. The smaller yards that service the Jones Act trade market have developed advanced techniques and can offer quality at competitive prices. However, most of the larger

shipyards specialize in military vessel construction and only a few have received orders to build merchant tankers.

The larger yards, however, are not usually perceived as being competitive. It is strange that the U.S. industry can lead the world in designing and building high-tech aircraft, yet lag so far behind in heavy industrial shipbuilding (Ref. 43:p. 108).

U.S. commercial shipbuilding prices are 2 to 3 times those for comparable vessels built in the Orient, particularly in the Republic of Korea and new building delivery times are twice as long as those of foreign yards for comparable ships (Congressional Budget Office, 1984: National Research Council, 1984a). U.S. ship repair costs are also higher in U.S. Yards (Ref. 41:p. 15-16).

Under the Jones Act, U.S. shipping companies find it difficult to avoid these costs. In 1920, Congress passed the Jones Act to protect its domestic shipping routes. This act extends protection to U.S. shipyards by requiring U.S. Shipping companies involved in domestic trade to build and repair ships at U.S. shipyards. Additionally, U.S. shipping companies may buy and repair ships overseas but there are penalties that must be paid. These long-standing requirements have contributed to the long-term decline of U.S. waterborne trading opportunities and in the U.S. flag fleet (Ref. 41:p. 63).

According to a study conducted by the National Research Council's Marine Board, American shipyards lag behind in four major technology categories:

- business-process technologies - the principal "up front management processes and other management activities, notably technologies for preliminary design, bidding, estimating, and sourcing, that are linked to the marketing capabilities of shipbuilders;

- system technologies - the engineering systems, such as process engineering and computer-aided design and manufacturing, that support the shipyard operations;
- shipyard production process technology - the methods used in fabricating, assembling, erecting, and outfitting vessels; and
- new materials and product technologies - the innovations, including new designs and new components, that meet particular market needs (Ref. 44:p. 2).

e. Shipping Companies

Since shipping companies are the organizations that own the ships and their business operations, they can be said to be the heart of the maritime industry. Given this position, changes in the environmental context, inputs in system direction in the form of policy, and the forces resulting from interactions with the other organizations in the maritime system are bound to have a significant impact on shipping companies. The decline of U.S. shipping companies and U.S. registered ships can be attributed to all of the above.

As shown above, shipping companies are burdened by the restrictive policies resulting from actions of the other organizations within the maritime systems framework. These internal burdens make it considerably more difficult for U.S. shipping companies to compete in the external environment, where shipping companies under foreign flags of convenience dominate trade. Although the United States, the world's largest trading nation, contributes nearly 20 percent of the world's maritime trade, its merchant fleet carried less than three percent of this cargo in 1998 (Ref. 43:p. 105). In 1999, open-registry ships accounted for 92.1 percent of the world's dead weight tonnage capacity. This coupled with lower freight rates that these ships can offer, lead to a conclusion that they probably carry a similar percentage of the world's ocean-born cargo.

Foreign-flag ships are able to offer lower freight rates because they incur "lower labor costs, lower operation costs, taxes, capital costs, and crewing expenses, with less government regulation and costly litigation" (Ref. 43:p. 105).

f. Maritime Administration

The Maritime Security Act of 1996 created the Maritime Security Program (MSP) which charges MARAD with promoting a privately owned, U.S. registered, and U.S. crewed dry cargo vessel inventory that can fulfill the national security requirements and remain competitive in world commerce (Ref. 16:p. 75). To this end, MARAD manages funding and maintenance of the National Defense Reserve Fleet, which includes the Ready Reserve Force (RRF); coordinates with the Military Sealift Command (MSC) the number and types of ships to be acquired, and what and when ships should be activated in defense emergencies; liaisons with the U.S. Transportation Command (USTRANSCOM) on sealift policy issues; establishes agreements with the U.S. Coast Guard and ABS over certifications and inspections; works out agreements with the Environmental Protection Administration for disposal of obsolete NDRF ships; awards RRF management contracts to U.S. flag shipping companies (Ref. 11); cooperates with USTRANSCOM to develop the Voluntary Intermodal Sealift Agreement; provides financial assistance to the U.S. merchant marine and shipyards for ship construction and yard modernization under Title IX of the Federal Ship Financing Program of the Merchant Marine Act of 1936 (Ref. 16); monitors U.S. cargo preference laws; funds maritime education and training at the U.S. Merchant Marine Academy and also assists

state maritime schools. Even this list does not fully disclose MARAD's entire scope of responsibilities.

As indicated above, MARAD's broad area of responsibility within the maritime systems framework ties it to most organizations within the maritime systems framework as it works towards moving the systems components towards improvement of the maritime industry. Nevertheless, MARAD faces some challenges because it is not in a position to resolve the critical issues that affect the maritime industry, as discussed above under the other organizations. Thus the U.S. flag fleet is expected to continue its decline (Ref. 29:p. 82). "Once the present aging fleet has been retired, the owners will continue with the program of foreign-flag replacements that are already well under way" (Ref. 42:p. 69). Thus, under the present conditions, it is highly probable that the U.S. will not be able to fulfill surge requirements without foreign flag vessels.

The objective then is to revitalize the U.S. merchant marine with enough mariners and ships to provide the sealift capability necessary during a national contingency.

2. Search - Identifying Alternatives

Although there are many organizations in this system, the following will examine three of these as alternatives to illustrate that only those able to set direction for the entire system have the means to effectively pursue systems objectives. The following alternatives might be considered:

One alternative is to do nothing and simply leave things as they are. Under this alternative MARAD can continue its efforts to keep the maritime industry afloat with the current programs and policies.

As a second alternative, the Department of Defense can capitalize on the shortage of merchant mariners and the aging RRF under MARAD to pressure to Congress and gain control of the RRF. It would then have direct control of more of its sealift capability.

In third alternative, Congress can develop policy that reduces the restrictions, penalties and higher operating costs faced by the U.S. flag shipping companies. Specifically: Congress could eliminate requirements to build or repair ships in U.S. shipyards; allow ships to employ only the crew necessary to operate efficiently and safely; enforce same standards on foreign ships calling on U.S. ports just as enforced on U.S. shipping; and promote a competitive market by removing other requirements that overburden U.S. shipping companies.

3. Forecasting

In the near future, the United States will likely continue to be involved in conflicts throughout the world, as it protects its interests and those of its allies. Thus, the requirement for sealift capability in support of such operations can be expected. However, the situation with the U.S. Merchant Marine will not get better if the status quo is maintained.

4. Modeling

As suggested by Thomas R. Dye in his work *Understanding Public Policy*, there are several policy models at work here. Over the years, political science has developed several models to aid in understanding public policy (Ref. 45:p. 18). Given the complexity and numerous entities involved with the maritime industry, probably all of the nine models Dye describes apply at one level or another. However, the discussion below will focus on the models that seem to have the greatest impact on the maritime industry.

One of these nine models is actually a very simplistic systems model. But since this model has already been covered at length above, suffice it to say that this model describes the maritime framework on the macro level as a bureaucratic political system at the high end of complexity. There are many players and no unitary actor or single objective.

The other models discussed here include the group model, the game theory model, and the institutional model. In the group model theory, groups struggle to influence public policy in their favor. Thus, on the micro level, each organization is operating from the group model theory and the ineffective maritime policy has been the result of the struggle amongst these groups. According to Dye, "game theory is a form of rationalism, but it is applied in competitive situations in which the outcome depends on what two or more participants do" (Ref. 45:p. 33). With so many organizations involved here, a few of them engage in this type of game to achieve optimum payoff after considering all of the opponent's possible moves. Last and most significant is the institutional model, in

which public policy is adopted, implemented, and enforced by a government institution. With this in mind the alternatives can now be put in the context of a model:

The alternative to do nothing would simply keep the current bureaucratic/political system in place at the macro level while the group model would remain at the micro level. The impact of this alternative can be expected to remain as it is now. Under this alternative, MARAD's role in the maritime industry has been established under the institutional model. The Maritime Security Act of 1996 clearly gives MARAD the responsibility to pursue the objective identified above. While MARAD's current role also puts it in a position where it can help push for collaboration between the significant stakeholders, it is doubtful it can achieve an equilibrium that produces maximum group gain, given each group's rational commitment to self preservation.

Although DoD sometimes runs under an institutional model, it will fall under the Game Theory Model in the event it vies for control of the RRF. The U.S. Navy engaged in this type of game theory with MARAD as it attempted to gain control over the RRF. It exposed the failures by RRF ships and went as far as buying some RRF ships. The Navy lost when Congress gave these RRF ships to MARAD and made it clear that MARAD would retain control of the RRF. This led to legislation in 1987, which reaffirmed MARAD as the sole authority to acquire and maintain RRF ships (Ref. 11:p. 8). Given this previous decision, it is not likely that DoD would get a favorable response from Congress. Additionally, while taking over the RRF would give DoD greater control over sealift capabilities, this move would have no significant impact on the objective; control of the RRF would simply shift but would not necessarily revitalize the merchant marine or increase surge capacity.

Policy created by Congress to lift the burden of regulation from the U.S. shipping companies would have the greatest impact on the U.S. maritime industry. Eliminating requirements to build ships in the U.S. would result in significant savings to U.S. shipping companies. While it may be argued that this would have dire consequences on U.S. shipyards, most large shipyards are employed in naval construction with very few involved in commercial construction. Additionally;

Most recent proposals to aid the U.S. shipbuilding industry-such as a federally funded merchant shipbuilding program, renewed construction subsidies, a federally backed maritime redevelopment bank, and expanded cargo preference-are either too small in scope to be of significant impact, do not address the most serious problems, or would create larger problems.(Ref. 41:p. 71)

A policy that allowed U.S. shipping companies to crew their ships with only the personnel necessary for safe and efficient operations would also result in significant savings. However, this would certainly have a negative impact on union job control. The combined savings from the above would transfer to the U.S. public in the form of lower freight rates while increasing the competitiveness of U.S. shipping companies.

A policy that enforces the same standards for all ships, whether U.S. flag or domestic, levels the competitive field and does not force U.S. flag ships to incur costs higher than those of open flag registry vessels calling upon U.S. ports. In this case, there would be an increase in costs to foreign flag-ships, which would in turn share the costs with consumers.

5. Synthesis

As noted above, keeping the status quo will not revitalize the U.S. Maritime Industry or ensure an adequate RRF. While MARAD has made significant efforts towards achieving this objective, current policy does not seem to sway the continued decline of the U.S. maritime industry. Hence, it is not a good alternative.

An attempt by a DoD organization to take over the RRF was rejected by Congress in the recent past. Therefore, it is not likely to receive a warmer reception the second time around. Furthermore, this alternative does nothing to achieve the objective at hand and is therefore not a good alternative.

The best alternative is for Congress to set policy that increases the competitiveness of the U.S. maritime industry. This increase in competitiveness could be used as an incentive to bring ships back under U.S. flag. This would in turn generate more sailing jobs and thus begin the first step towards revitalizing the U.S. maritime industry.

E. CONCLUSION

This chapter cannot begin to address the complexity of the dilemma facing the U.S. Merchant Marine, or the important role it plays in national strategy. However, the simple models employed here were helpful in breaking down the intricate and challenging maritime industry. This made it possible to lay out coherently some of the most significant components that make up the maritime systems framework to aid analysis and better illuminate the problem at hand.

The systems model indicated that the most significant problem lay in the system inputs, specifically in the area of direction setting policy. The process of policy analysis began by clarifying the problem and determined the objective: To revitalize the U.S. merchant marine with enough mariners and ships to provide the sealift capability necessary during a national contingency. It also examined a few alternatives and their impact, to identify the best alternative for achieving the objective. Through policy, Congress is the organization that can most effectively revitalize the U.S. merchant marine with sufficient mariners and ships to provide the sealift capability necessary during a national contingency.

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VI. NATIONAL SECURITY SEALIFT REQUIREMENTS AND THE AMERICAN MERCHANT MARINE CAPACITY

A. NATIONAL SECURITY STRATEGY AND CAPACITY REQUIREMENTS

The United States is the only remaining superpower. Its military is second to none, with the most advanced technology and the best-trained personnel. In recent years, the U.S. military has become a useful diplomatic tool and a police force supporting human rights and democracy around the world. Every year, as part of the military budget process, the President of the United States lays out the nation's National Security Strategy and from that the Joint Chiefs of Staff develop the National Military Strategy. These two documents are the sources that call for the requirement to prepare to fight two nearly simultaneous major theater wars (MTW). Specifically, the National Security Strategy for 1997 states:

At the high end of responding to crises is fighting and winning major theater wars. This mission will remain the ultimate test of our Total Force our active and reserve military components and one in which it must always succeed. For the foreseeable future, the United States, in concert with regional allies, must remain able to deter credibly and defeat large-scale, cross-border aggression in two distant theaters in overlapping time frames. (Ref. 46)

The National Military Strategy for 1997 follows that by stating:

As a global power with worldwide interests, it is imperative that the United States be able to deter and defeat nearly simultaneous, large-scale, cross-border aggression in two distant theaters in overlapping time frames, preferably in concert with regional allies....The capability to fight two major theater wars initiated in rapid succession is of critical importance as it helps deter opportunism, promote stability, and provide the depth and flexibility to deal with unanticipated challenges. (Ref. 47)

Based on these two strategy statements, each individual service developes plans and force structures that would be needed to support and sustain the nation's forces and meet the two MTW requirements. Much of the current estimates are based on Operation Desert Storm/Desert Shield lessons learned and models. The most recent numbers come from the models run in the recently completed Mobility Requirements Study – 2005 (MRS-05), a comprehensive review of the military's airlift and sealift capabilities. Designed to account for the evolutions and changes in the Department of Defense since the last Mobility Requirements Study conducted in 1995, MRS-05 drew on large volumes of data in defining mobility requirements for 2005. From all of the data and related simulations, the required sealift capabilities were estimated. The immense complexities involved with this calculation are far beyond the scope of this thesis. Over 32 different factors, such as timing, port location and availability, individual ship characteristics and load out are all included in the calculations. The numbers represented in Table 7 are a final estimate of the total cargo requirement to be moved in the most likely simulation of two major theater wars, one in Southeast Asia and one in the Persian Gulf (Ref. 48).

	Unit Equipment	Dry Sustainment	Ammunition
First Major Theater War			
Total Required	2,120,000	800,000	. 615,000
Second Major Theater War			
Total Required	1,305,000	915,000	365,000
TOTAL	3,425,000	1,715,000	980,000

Table 7. Two Major Theater War Estimated Dry Cargo Requirements

To get an idea of the cargo capacity that would be required for a two MTW strategy, the above numbers can be compared with Appendix F which lists the strategic sealift tonnage moved in the Gulf War, broken down into the individual sources. For the purposes of this thesis, a month-to-month break down of each individual sealift asset would be too complex. Additionally, it would only serve to duplicate the more extensive and sophisticated techniques used in developing the MRS-05 and is not the focus of this research.

B. SEALIFT ASSETS AND PRIORITIES

The required tonnage is to be moved by several different strategic sealift fleets. For the ease of data manipulation and to get the worst-case scenario, this discussion assumes that no foreign vessels would be contracted; the United States would rely on the U.S. flag commercial fleet as well as U.S. government owned vessels for sealift capacity. The Department of Defense has set out priorities for contingency sealift and which programs would be activated first and in what order. This priority order is as follows:

1. Prepositioned Vessels
2. Fast Sealift Ships
3. Ready Reserve Fleet
4. Volunteers (Commercial Charters)
5. U.S. Flag
6. Foreign Flag
7. Voluntary Intermodal Sealift Agreement Activation
 - a. Stage I (Sealift requirements early in a contingency or MTW)
 - b. Stage II (Additional requirements for a single MTW)
 - c. Stage III (Unforecasted Requirements beyond Stages I and II – Includes MSP vessels)
8. Sealift Readiness Program activation
9. Requisitioning of U.S. flag and Effective U.S. Control of foreign-flag vessels. (Ref. 21)

Each of these sealift assets, with the exception of volunteers and foreign-flag vessels, will be discussed below along with a list of vessels and approximate tonnages, if available.

1. Military Sealift Command Prepositioning Program

Owned and operated by USTRANSCOM's subordinate command, the Military Sealift Command, the Prepositioning Program consists of 33 civilian-manned vessels. The program is essentially a fleet of vessels preloaded with equipment and supplies, and strategically located around the world close to potential crisis areas. These vessels provide a fast response to support the initial troop deployments while the rest of the military and sealift capacity is being activated. The Combat Prepositioning Force (CPF) consists of thirteen vessels designed to support Army operations; they carry enough combat material, food, water, and other essentials to sustain two Army heavy brigades, including 6,000 soldiers, for 30 days. The thirteen Maritime Prepositioning Force (MPF) vessels are split into three squadrons, located in the Mediterranean, the Indian Ocean at Diego Garcia, and the Western Pacific at Guam and Saipan. Each squadron has sufficient equipment, supplies and ammunition to support a Marine Corps Air Ground Task Force for 30 days. The final seven vessels make up the Logistics Prepositioning Force (LPF), which serves Air Force, Navy and Defense Logistics Agency needs and includes one ship that serves as a Navy field hospital. Two aviation support vessels that can act as mobile Marine Corps aircraft maintenance facilities are also part of the program (Ref. 9).

Included in this fleet are the Large Medium-Speed Roll-On/Roll-Off (LMSR) vessels currently being delivered to the fleet or under construction. The initial order is for eleven of the new Bob Hope class of LMSR, which will be added to the MPF fleet as

they are launched. Once all eleven of the ships are delivered, the MPF will have a vastly improved sealift capability. Figure 2 depicts one of the MPF vessels, the MV 2nd LT JOHN P BOBO. Figure 3 is the first of the new LMSR class of ships, the USNS BOB HOPE. Table 7 lists the current Prepositioning Program vessels and their approximate cargo capacity, broken up into their respective forces and squadrons.

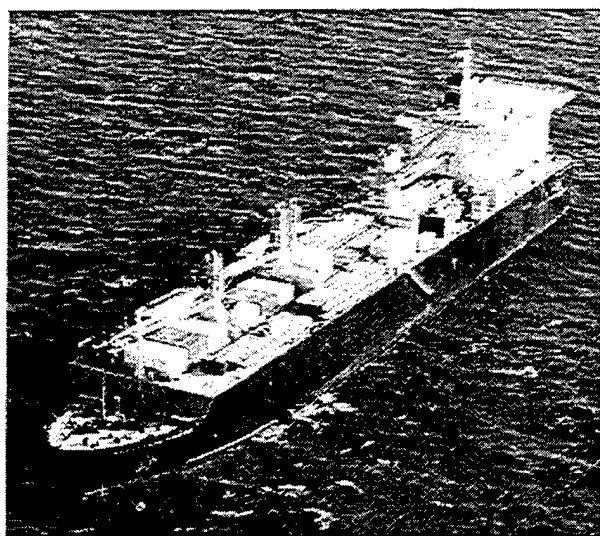


Figure 2. MPF Squadron One vessel, MV 2nd LT JOHN P BOBO (T-AK 3008)

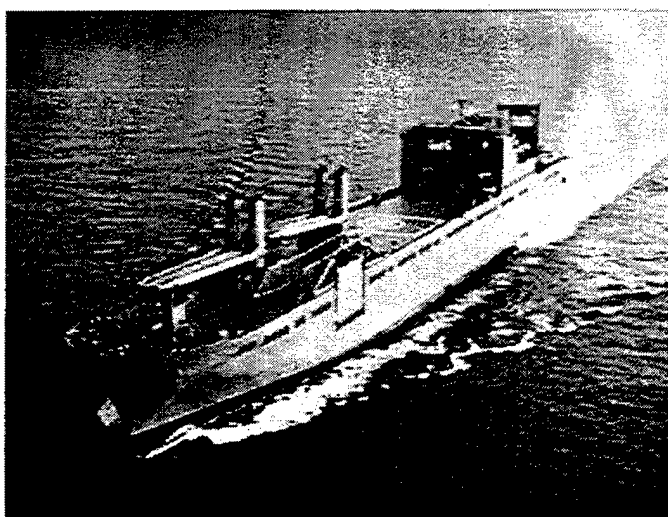


Figure 3. USNS BOB HOPE (T-AKR 300)

VESSEL NAME	HULL NUMBER	LOCATION	GROSS TONNAGE	CARGO CAPACITY SQ FT	CARGO CAPACITY TEU	CREW
Maritime Prepositioning Ship Squadron One						
MV 2ND LT JOHN P. BOBO	T-AK 3008	Mediterranean	44,330	152,185	530	38
SS SGT MATEJ KOCAK	T-AK 3005	Mediterranean	48,754	152,236	361	34
SS PFC EUGENE A. OBREGON	T-AK 3006	Mediterranean	48,754	152,236	361	34
SS MAJ STEPHEN W. PLESS	T-AK 3007	Mediterranean	48,754	152,236	361	34
MV 1ST LT HARRY L. MARTIN	T-AK 3015	Mediterranean	47,777	127,000	767	36
Maritime Prepositioning Ship Squadron Two						
MV PFC JAMES ANDERSON Jr.	T-AK 3002	Diego Garcia	46,552	121,595	361	32
MV PFC WILLIAM B. BAUGH	T-AK 3001	Diego Garcia	46,552	121,595	361	32
MV 1ST LT ALEX BONNYMAN	T-AK 3003	Diego Garcia	46,552	121,595	361	32
MV CPL LOUIS J. HAUGE Jr.	T-AK 3000	Diego Garcia	46,552	121,595	361	32
MV PVT FRANKLIN J. PHILLIPS	T-AK 3004	Diego Garcia	46,552	121,595	361	32
Maritime Prepositioning Ship Squadron Three						
MV SGT WILLIAM R. BUTTON	T-AK 3012	Guam/Saipan	44,330	152,185	530	38
MV 1ST LT BALDEMER LOPEZ	T-AK 3010	Guam/Saipan	44,330	152,185	530	38
MV 1ST LT JACK LUMMUS	T-AK 3011	Guam/Saipan	44,330	152,185	530	38
MV PFC DEWAYNE T. WILLIAMS	T-AK 3009	Guam/Saipan	44,330	152,185	530	38
Combat Prepositioning Ships						
MV LT COL JOHN D. PAGE	T-AK 4496	Diego Garcia	48,780	10,227	1,466	25
SS GOPHER STATE	T-ACS 4	Guam/Saipan	17,130	45,000	300	33
MV AMERICAN CORMORANT	T-AK 2062	Diego Garcia	38,571			21
MV STRONG VIRGINIAN	T-AK 9205	Diego Garcia	16,428		1,413	23
MV LTC CALVIN P. TITUS	T-AK 5089	Guam/Saipan	48,780	10,227	1,466	25
MV SP5 ERIC G. GIBSON	T-AK 5091	Guam/Saipan	48,780	10,227	1,466	25
USNS DAHL	T-AKR 312	Diego Garcia	72,718	394,673		29
USNS WATSON	T-AKR 310	Diego Garcia	72,718	394,673		29
USNS BOB HOPE	T-AKR 300	Diego Garcia	69,365	397,413		29
USNS SISLER	T-AKR 311	Diego Garcia	72,718	394,673		29
USNS RED CLOUD	T-AKR 315	Diego Garcia	72,737	394,673		29
USNS CHARLTON	T-AKR 316	Diego Garcia	72,718	394,673		29
Logistics Prepositioning Ships						
MV MAJOR BERNARD F. FISHER	T-AK 4396	Diego Garcia	48,780	10,227	1,466	21
MV CAPT. STEVEN L. BENNETT	T-AK 4296	Mediterranean	53,727		1,526	25
MV BUFFALO SOLDIER	T-AK 322	Diego Garcia	41,002	Tanker		19
SS CAPE JACOB	T-AK 5029	Diego Garcia	12,693	68,084		36
SS PETERSBURG	T-AOT 5075	Guam/Saipan		Tanker		33
SS POTOMAC	T-AOT 181	Diego Garcia	35,255	Tanker		33
USNS HENRY J. KAISER	T-AOT 187	Diego Garcia	20706	Tanker		27
SS WRIGHT	T-AVB 3	US East Coast	12,450	36,700	426	40
SS CURTISS	T-AVB 4	US West Coast	12,450	36,700	426	40
TOTAL			1,536,955	4,550,778	16,260	1,088

Table 8. Military Sealift Command Prepositioning Program Vessels, Location, Cargo Capacity, and Crew Requirements.

2. Fast Sealift Ships

The eight Fast Sealift Ships (FSS) are among the fastest cargo ships in the world. All were originally built as container ships for Sea-Land Service, Inc., Port Elizabeth, New Jersey. However, they were not cost-effective compared with other commercial merchant ships because of their high fuel consumption. The ships can travel at speeds of up to 33 knots; they are capable of sailing from the U.S. East Coast to Europe in just six days, and to the Persian Gulf via the Suez Canal in 18 days, thus ensuring rapid delivery of military equipment in a crisis. Together, these eight ships are capable of moving 93% of an Army Mechanized Division in one voyage (Ref. 49: p843). Seven of the eight were responsible for moving approximately 13% of all Gulf War cargo (Ref. 50:p. 116). Fast Sealift Ships are roll-on/roll-off and lift-on/lift-off ships, equipped with on-board cranes and self-contained ramps that enable the ships to off-load onto lighterage when anchored at sea or in ports where shore facilities for unloading equipment are unavailable. The vessels are specially suited to transport heavy or bulky unit equipment, such as tanks, large wheeled vehicles and helicopters (Ref. 51).

Figure 4 is the USNS DENEbola, one of the FSS fleet: Table 8 lists the eight FSS vessels and their characteristics.

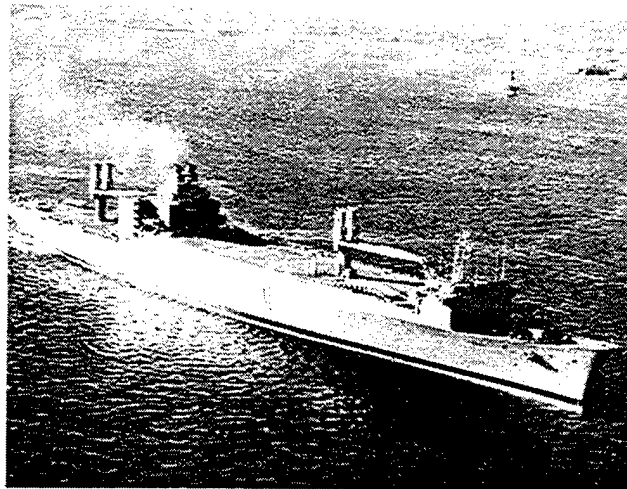


Figure 4. USNS DENEbola, Fast Sealift Ship

Vessel Name	Gross Tonnage	Deadweight Tonnage	Cargo Capacity (SQFT)	Officers	Unlicensed	USCG Minimum Crew	Fully Operational Crew
ALGOL	48,904	25,248	334,055	16	26	24	42
ALTAIR	49,262	25,594	334,055	16	26	24	42
ANTARES	48,525	24,270	334,055	16	26	24	42
BELLATRIX	48,142	25,914	334,055	16	26	24	42
CAPELLA	48,143	25,406	334,055	16	26	24	42
DENEbola	48,143	27,337	334,055	16	26	24	42
POLLUX	48,525	27,290	334,055	16	26	24	42
REGULUS	48,635	27,290	334,055	16	26	24	42
TOTAL	388,279	208,349	2,672,440	128	208	192	336

Table 9. Fast Sealift Ship characteristics

3. Ready Reserve Force

Owned by MARAD, the Ready Reserve Force (RRF) is the largest source of quick response shipping available to deploy military forces overseas, both in number of ships and cargo carrying capacity. The RRF currently contains 91 ships. The operation and maintenance of these vessels is contracted out to commercial ship operators and the ships are kept in various states of readiness. The operators have from four to thirty days to man and activate the ship if called upon. Those vessels in the highest state of readiness, four and five day, are kept in a reduced operating status and manned with a

caretaker crew of nine to ten mariners. Once the ships are activated, they are placed under the operational command of the Military Sealift Command. The crew is then rounded out to its full complement by the unions, as required. The fleet is composed of a militarily useful mix of breakbulk, RO/RO, heavy lift, tanker, LASH, troopships and crane ships. A majority of the RRF vessels are home ported at either James River, Virginia; Beaumont, Texas; or the San Francisco Bay area, California. A short description of each type of vessel in the RRF follows.

a. Breakbulk

The oldest type of vessel, a breakbulk is a labor and time intensive vessel to load and unload. Most commercial carriers have eschewed this type of vessel in favor of faster and more efficient container vessels. Breakbulk vessels are very useful for military applications, due to their ability to handle odd shaped or heavy equipment. This flexibility explains why there are fifteen of them in the RRF, despite their slow load/unload times and higher crew requirements.

b. Roll On/Roll Off

RO/RO vessels are considered to be the most militarily useful sealift vessel. With stern ramps and side ramps, vehicles and cargo can simply be driven onboard, secured, and driven off again at the destination. Requiring fewer crewmembers than a breakbulk, RO/ROs have become the type of sealift vessel owned by the U.S. government and a focus of sealift planners. In addition to the FSS and the LMSRs in the MPF, the RRF has 29 RO/ROs in its inventory.

c. Lighter Aboard Ship and SEABEE

Less common, Lighter Aboard Ship (LASH) and SEABEE vessels are essentially barge carriers. These vessels load and unload barges, called lighters, either

via a crane or an elevator. Developed around the same time as the container vessel, LASH and SEABEE's never gained the same popularity as container ships. Many of these vessels have been scrapped, sold or converted to container ships. The military finds these vessels useful because the lighter can handle larger equipment than containers. They also provide flexibility to unload this type of vessel in an unimproved port by anchoring out and towing the much smaller lighters to the pier. The manning level is comparable to a container vessel or RO/RO. The RRF has four LASH and three SEABEE vessels. Figure 5 is the SS GREEN HARBOUR, one of the RRF LASH ships.

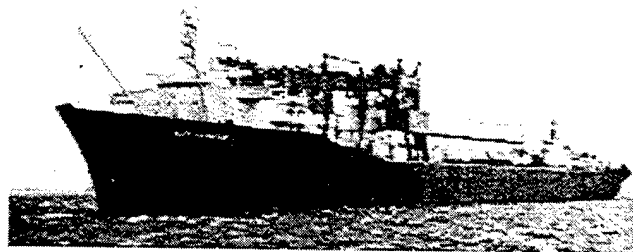


Figure 5 SS GREEN HARBOUR, LASH Vessel

d. Crane Ship

The crane ship, designated as a T-ACS, is a vital part of the RRF and has been used extensively in almost every RRF call-up. These vessels are essentially floating cranes. Their purpose, besides lifting and carrying heavy cargo and acting as heavy lift vessels, is to pull alongside a pier that does not have its own cargo handling equipment and serve as the unloading gear for other ships. Nested with one side to the dock and the other to the ship to be unloaded, a T-ACS uses its crane to discharge the other vessel's

cargo. These are relatively labor-intensive vessels for their small size and comparatively small cargo capacity. But this is more than equaled by their usefulness in unimproved ports. The RRF has ten of these vessels. The SS GRAND CANYON STATE is depicted in Figure 6.

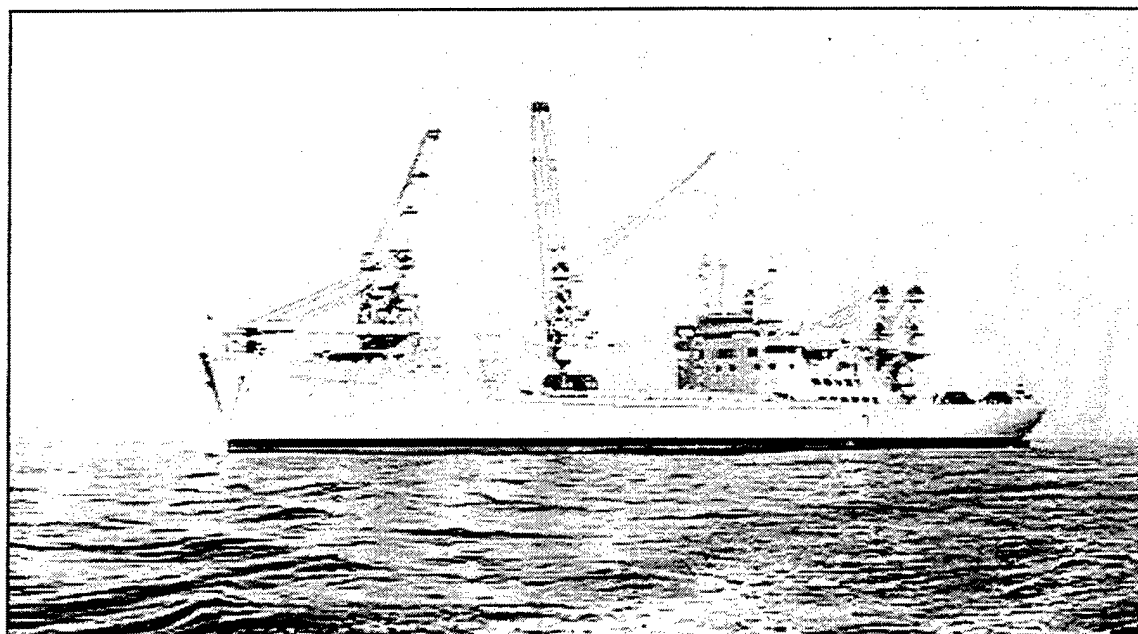


Figure 6. SS GRAND CANYON STATE, T-ACS Crane Ship

e. Special Mission

The RRF also contains several vessels for special purposes. These vessels include four Offshore Petroleum Discharge Ships (OPDS), two aviation maintenance vessels assigned to the LPF, troop carrying ships, and several small tankers. Two specialized oil tankers normally included with the RRF have continued to support MSC's Prepositioning Program and are included in the APF. One of the aviation maintenance vessels is pictured in Figure 7

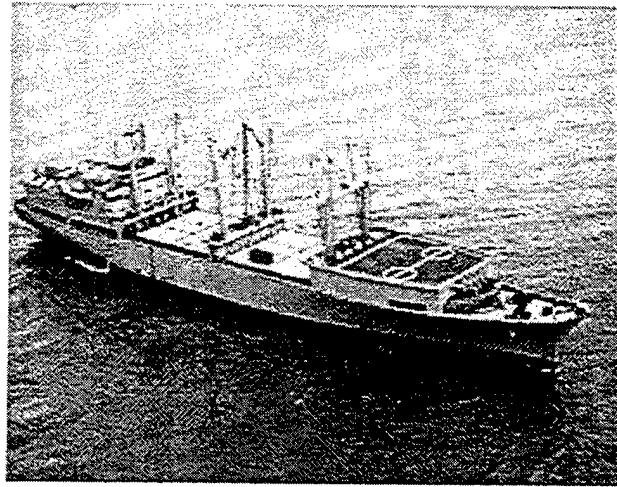


Figure 7. SS CURTIS, Aviation Maintenance Vessel

The RRF was a major participant in Operation Desert Storm/Desert Shield. Approximately 79 vessels were activated for the conflict and carried more than 28% of all cargo sent to the Arabian Gulf (Ref. 50:p. 116). The lessons learned from the activations are still appreciated today. Problems with outdated or poorly maintained engines, bridge equipment, and manning shortages spurred much research and review of the RRF. MARAD has done much to improve force readiness. As the November 1994 GAO report, *Ship Readiness Has Improved but Other Concerns Remain*, states, "The readiness of the RRF has improved since the Persian Gulf War due to the \$1 billion invested in the program. Officials from the Military Sealift Command, American Bureau of Shipping, and MARAD agree that the satisfactory readiness of RRF ships is primarily due to the identification and repair of machinery deficiencies during and after the war." (Ref. 39:p. 20) A complete list of all the current RRF vessels can be found in Appendix G.

The RRF is actually a subset of a larger fleet. This fleet, the National Defense Reserve Fleet (NDRF) consists of 254 vessels, including the 91 RRF ships, primarily dry

cargo and tankers. At its peak in 1950, the NDRF had 2,277 ships in lay-up. However, the last time vessels of the NDRF were used, other than the RRF, was during the Vietnam conflict; 172 vessels were activated to meet military requirements rather than requisitioning commercial vessels away from their commercial routes (Ref. 52). Many debate the usefulness of the current NDRF vessels, especially considering many of the vessels are over 40 years old. Considering the condition of these vessels, their age, and the time that would be required to activate them, they are not considered in this thesis.

4. Voluntary Intermodal Sealift Agreement/Maritime Security Program

The Voluntary Intermodal Sealift Agreement (VISA) was created in February 1997 after approving the Maritime Security Act of 1996 and establishing the Maritime Security Program (MSP). As of January 1999, there were 109 American flag vessels enrolled in VISA. This includes 89 container ships, 12 RO/RO ships, 4 LASH, and 4 breakbulk ships. In addition to that, 52 ocean supply vessels and over 100 ocean-going tugs and barges are enrolled (Ref. 21:p. 10). The companies enrolled in the plan are listed in Table 4, but an actual list of the 109 vessels could not be located. As per the sealift priority order listed in Section A above, VISA and MSP vessels are one of the final assets the military would utilize. This minimizes the potential impact activation would have on the participating commercial companies supplying the capacity when called upon. Naturally, the company must prove that it can support the capacity it is enrolling prior to being added to the program.

One very important characteristic of the VISA/MSP program is the coordination between the shipping companies if the Stages are ever activated. The Department of

Defense can use a proportion of the total system capacity, rather than naming specific vessels. Carriers are allowed to coordinate with each other to provide capacity on activation. This provides flexibility, while minimizing the disruption to commercial shipping operations. Coordination also helps to protect market share, where a temporary withdrawal from a given lane can have serious long-term effects for a shipping firm (Ref. 21:p. 12).

Since an actual list of vessels enrolled in VISA was not found, data from the MRS-05 study must be used. Tables 9 and 10 list the VISA Capacity and the break down of the VISA fleet projected to 2005 (Ref. 48: Appendix K).

	Stage I	Stage II	Stage III
RO/RO Sq Ft	143,956	383,714	1,335,041
TEU	22,556	60,147	154,107
MTON	42,685	113,827	229,504

Table 10. Cumulative VISA Capacity Commitment 2005

<i>Ship Type</i>	<i>Number</i>	<i>Sq Ft</i>	<i>TEU</i>	<i>MTON</i>
RO/RO	3	479,696	1,476	0
Car Transport	6	745,023	0	0
LASH	4	0	1,152	147,260
Containership	56	0	140,631	0
Total	69	1,224,719	143,259	147,260

Table 11. VISA Fleet Representation

5. Sealift Readiness Program

The Sealift Readiness Program (SRP) is an agreement between U.S. Flag carriers and MSC for acquiring ships and related equipment. It is the precursor to VISA, created in 1936 after passing the Merchant Marine Act of 1936. In fact, public law states "No vessel may receive construction differential subsidy or operational differential subsidy if it is not offered for enrollment in a sealift readiness program approved by the Secretary of Defense." (Ref. 53) Essentially, under either public law or as a precondition for carrying military cargoes, U.S. ship owners and U.S. Flag ships are required to commit 50 percent of their cargo capacity to MSC for use during less-than-full mobilization, contingencies, and emergencies.

As per the priority of sealift, the SRP would only be activated if available commercial charter shipping is insufficient, government owned sealift is not available or inadequate, VISA Stage III is activated, and the Secretary of Defense, in coordination with the Secretary of Transportation, gives final authorization. However, the SRP has never been activated (Ref. 19:p. 15-16). At the time of Desert Storm/Desert Shield, there were 122 militarily useful vessels in the program, 99 dry cargo and 23 tankers. USTRANSCOM ended up using 62 of the SRP vessels without actually activating the program (Ref. 50:p. 124). There are ships still enrolled in the SRP, but no list of them was found. It is assumed that the vessels still receiving ODS contracts are enrolled in the program. A ship will remain in the program until its obligation expires or it enrolls in VISA. For the purposes of this thesis, the tonnage of these vessels will not be considered.

6. Requisitioning U.S. Flag and Effective U.S. Control of Foreign-Flag Vessels

The Roosevelt Administration devised the Effective U.S. Control (EUSC) concept on the eve of World War II to circumvent the Neutrality Act. U.S. ship owners were encouraged to register ships in Panama and Honduras so that U.S. aid could be transported to European "allies" before the United States officially entered the conflict (Ref. 28). This concept of "effective control" by the United States in times of emergencies applies to vessels flying a Flag of Convenience (FoC) and where either the shipowning company or the long-term charter is majority owned by U.S. nationals. Under this program, ship owners enter into a voluntary contract with the Maritime Administration, called an "Effective Control Commitment Agreement." MARAD may requisition the vessel for service in time of emergency, and may, if necessary, purchase it and transfer the vessel to U.S. Flag. In return for this, the ship owner receives free U.S. war risk insurance and charter lines (Ref. 2:p. 120).

Labor unions and American shipyard companies have lobbied against this program, feeling that if U.S. companies were no longer able to operate under a FoC, most would be forced to "come home" and boost the sagging industry. Of course, the flip side of this is that some companies may just fold. Regardless, the labor unions lobbied to repeal certain tax deferral benefits available to U.S. companies using FoCs, in an effort to bring back jobs. In 1986, their efforts were successful and the Tax Reform Act passed that year eliminated that benefit. Since then, the EUSC fleet has dwindled. From 1985 to 1994, the deadweight tonnage of the fleet fell from 37.0 million tons to 19.8 million, the number of bulk carriers fell from 73 to 33, and the number of tankers fell from 225 to 129 (Ref. 2:p. 125). EUSC was used in Korea, Vietnam and the Gulf War without

transferring any vessels to the U.S. Flag. However, the majority of the eligible vessels are comparatively slow, large bulk tankers or dry bulk with limited military usefulness. As of January 1999, this fleet consisted of 214 vessels, of which only 102 were deemed militarily useful (Ref. 28). As with the SRP, a list of these vessels was not available; considering that they use non-U.S. sailors, these vessels will not be considered.

B. DETERMINING THE REQUIRED SHIPS

Having assessed the tonnage requirements to meet the national security strategy, and the number of ships the government has at its disposal for this purpose, the number of ships required can now be estimated. A simple comparison of the cargo requirements to the cargo capacity provided by the available vessels yields the necessary number of ships. Of course, this simple comparison must also take into account the type of cargo (i.e. break bulk, bulk, or liquid) and the corresponding ship capacity. Table 11 summarizes the approximate total tonnage available and approximate total cargo capacity from above.

Asset	Gross Tonnage	Deadweight Tonnage	Cargo Capacity Sq ft	Cargo Capacity TEU	Crew
MPF	1,536,955		4,550,778	16,260	1,088
FFS	388,279	208,349	2,672,440		336
RRF	1,132,818	1,238,970	5,301,052	UNK	2,404
MSP/VISA	UNK	UNK	1,224,719	143,259	UNK
TOTAL	2,906,702	1,447,319	13,665,362	157,201	3,701

Table 12. Summary of Sealift Assets Cargo Capacity and Crew Requirements

It is apparent that surge prerequisites in support of the national security strategy would require activating the RRF as well as calling up the VISA and MSP fleets. These sources should provide sufficient fleet capacity to transport all the necessary military equipment and cargo in time of war without relying on allied or foreign-flag vessels. This is confirmed by the MRS-05 study, which stated, "The programmed organic dry cargo fleet is adequate to meet projected requirements. The Department [of Defense] should execute the current program" (Ref. 48:p. 6). One fact worth mentioning, however, is the MRS-05 study included the EUSC fleet and some allied shipping, which added 111 vessels with approximately 2.3 million square feet of cargo space and over 34,000 TEU (Ref. 48:Table G.31). These vessels, as mentioned, were not included in this thesis due to insufficient data and a concentration on the organic commercial and U.S. government-owned fleets.

Another factor not taken into account is the time frame involved in moving the cargo. There is no doubt that all the equipment and supplies could be carried on the government-owned fleet. However, military planners naturally want the fighting forces to be fully equipped as soon as possible to support the soldier on the ground and to end the conflict quickly. Taken to the extreme, the military's needs could be met by multiple voyages of only a few vessels, but the build up of forces is governed by a timeline established by the services, and all efforts must be made to meet those times.

For future conflicts, sealift capacities may be available from allied and other foreign nation fleets, as they were for the conflict against Iraq. However, they are not included in this estimate because there are no guarantees that other nations will support our next armed conflict; several occurrences of foreign flag baulkers during the Gulf War

raised concern over the reliability of contracted foreign vessels. For multiple reasons, including political, religious, pay disputes and most often fear of entering a combat zone, there were at least thirteen foreign-flag ships carrying U.S. cargo that hesitated or refused to enter the gulf (Ref. 50:p. 136). All cargo was eventually transloaded, but these instances clearly showed the inherent risks in relying on non-U.S. flag crews and vessels. Meeting the tonnage requirement with solely U.S. organic fleet assets would stretch the abilities of the merchant marine industry, possibly to the breaking point. Considering that commercial carriers would still operate all of their normal vessels, activating all the MPS and RRF vessels would create a tremendous manning strain. This strain will be considered in the next chapter.

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VII. BILLETS AND MARINERS

A. THE MARINER ISSUE

Merchant mariners perform a vital role in time of war. Their importance to the war effort has certainly made them a target to enemies with the capability to attack our supply lines at sea. In fact during World War II, the United States Merchant Marines paid a higher price per capita than any other service, with the exception of the United States Marine Corps: 596 merchant ships were sunk with 6,835 men lost at sea (Ref. 54). Considering the greater cargo capacity of modern ships, and the fact that there are fewer of them today, losses of a similar magnitude would be absolutely devastating. Although more ships could be activated from the National Defense Reserve Fleet, replacements for lost mariners may be a challenge given the uncertainty about the size of the mariner pool. Therefore, researching and tracking the number of mariners is imperative if America expects to fulfill surge and sustainment requirements during a national emergency.

The issue then becomes how to find the number of mariners required as well as the number of mariners available to man up the critical sealift vessels as well as the commercial fleet through surge and sustainment periods. The armed forces of the country have a reserve system that allows them to pull in additional manpower when the regular active forces need bolstering or are otherwise occupied. The Merchant Marine has a similar reserve but there are serious concerns that it is so poorly maintained and operated that its reliability is questionable, and as such it is a subject worthy of in depth research in itself. There is a thesis to be completed in June 2001 by LCDR Mark Jones entitled *The Potential Role of the United States Maritime Service (USMS) in Supporting*

Ready Reserve Force (RRF) Vessel Crewing Needs which will give an analysis of this issue.

Studies on the actual tracking of merchant mariners are scarce. A dozen studies have been done on merchant marine manning since 1971, but most cite numbers and totals of mariners without supporting data. Additionally, few provide sufficient details on how those numbers were determined, and these often use methods that do little to help determine the American mariner pool. For instance, one study estimated the worldwide supply of mariners by using data supplied by almost two hundred companies, weighted to reflect a representative sample of the world fleet (Ref. 55:p. 1). Few studies even address the issue of tracking the employment pool. Appendix H gives a partial list of some of these studies.

For Operation Desert Storm/Desert Shield, MARAD needed nearly 4,200 additional commercial mariners to crew the RRF. Many of these were former mariners who came out of retirement to sail, including some veterans of World War II, Korea, or Vietnam. Nearly 200 midshipmen from the U.S. Merchant Marine Academy served on these ships as well. In 1990, the average age of a U.S. merchant sailor was 49 years old. Many of the mariners that manned the RRF during Desert Storm were in their 60s and 70s. At least two were in their 80s and the oldest was 92. There were also teenagers sailing as well (Ref. 50:p. 132). The Seafarers International Union greatly expanded its entry-level training program from 60 to 200 to try and put bodies on the ships. All total, approximately 9,800 American mariners served during the Gulf War, often enduring long hours with little or no leave.

Despite the occasional comment to the contrary, there were manning problems during the Gulf War. These were especially apparent in the senior engineers who knew how to operate and maintain the steam propulsion plants that dominate most of the RRF. The Coast Guard was forced to relax certain licensing and training requirements to ensure an adequate supply of mariners (Ref. 50:p. 127). Considering the condition of the industry in 1990 with today's industry, a simple extrapolation gives the impression that due to the decline of the industry over the last decade, the number of mariners has also likely declined.

B. THE ORIGINS OF THE MARINER PROBLEM

In days past, merchant sailors were in an enviable profession. They traveled the world to far, exotic places, had a relatively easy job with a lot of time off, and made a relatively large amount of money. The typical mariner was relatively reclusive and very mobile. The industry was so attractive that no real concern was given to manning the merchant fleet during a crisis. The maritime academies were pumping new officers into the field and numerous union schools were keeping the unlicensed ranks plump.

That is no longer the case, as fewer people are taking careers at sea. Many factors have reduced the desirability of a career in the maritime industry. Older mariners are retiring and mid level sailors are finding more stable jobs on shore. More than that, a vital factor is a substantial decrease in pay. In an effort to compete with cheaper foreign companies, American shipping companies have successfully negotiated with the unions to reduce pay for the sailors.

In the modern job market where a new employee at a fast food restaurant is making nine dollars an hour, the thought of going out on a ship for months at a time for

less money is not overly appealing. Many sailors have found they can work in the shore-side industry and actually make more money, without the hassle of leaving home and their families. And while merchant ships offer the opportunity to travel all over the world, time is money in the modern maritime industry, so port stays are often less than eight to twelve hours. The faster the ship can get in and out of port, the more money the company can make, or save in port fees. So mariners who sail to see the world get a view of it from the cargo docks and more and more do not even have the chance to go out in town.

A recent complication related to sailing in the modern merchant fleet is the increased regulatory requirements for merchant mariners sailing between the United States and other countries. In order to cut manning costs, most merchant ships no longer carry a dedicated Radio Officer and the watchstanding mates are responsible for the communications equipment. The STCW convention has also increased the number of qualifications the mariner is required to have. Figures 7 and 8 compare the differences in required qualifications before and after the STCW implementation. These new qualifications can take at least seven weeks to complete and the course fees, per diem, and loss of wages could reach \$20,000 per mariner (Ref. 26)

Taking into account the declining fleet, decreasing pay, increased qualification requirements, and declining benefits of going to sea compared to staying ashore, it is not surprising that the number of qualified mariners in the employment pool is shrinking.

Deck Officer Requirements	
1996	2003*
1. U.S. Coast Guard License	1. U.S. Coast Guard License
2. Radar Endorsement	2. Radar Endorsement
-	3. STCW Endorsement
-	4. FCC GMDSS License
-	5. GMDSS Operator's Course Endorsement
-	6. ARPA Endorsement
-	7. Roll-On/Roll-Off Endorsement
-	8. Advanced Firefighting Certificate
-	9. Bridge Teamwork Course Endorsement
-	10. Personal Survival Course Endorsement
-	11. Personal Safety & Social Responsibility Course Endorsement
*All officers seeking renewal of their licenses must produce proof of either recent of sailing or attendance at refresher courses within the five-year renewal period.	

Figure 8. Deck Officer Qualification Requirements

Engineering Officer Requirements	
1996	2003*
1. U.S. Coast Guard License	1. U.S. Coast Guard License
-	2. STCW Endorsement
-	3. Roll-On/Roll-Off Endorsement
-	4. Advanced Firefighting Course
-	5. Personal Survival Course Endorsement
-	6. Personal Safety & Social Responsibility Course Endorsement
*All officers seeking renewal of their licenses must produce proof of either recent of sailing or attendance at refresher courses within the five-year renewal period.	

Figure 9. Engineering Officer Qualification Requirements

C. MARINER TRACKING SYSTEMS

There is no doubt that the mariner pool is nowhere near what it was at its height. But even with the mariner pool dwindling to levels of concern, there seem to be no official figures on the exact number of merchant mariners. Given the importance of the mariner pool, why is it so difficult to determine how many mariners are in this pool and what is being done to correct this problem?

In the past, there was no real concern about a shortage of mariners, so no methods were made to track them. Even the United States Coast Guard, the agency responsible for all licensing and qualifications, barely kept any other records of mariners. Most shipping companies rely on labor unions for manpower and therefore do not hold databases that can describe the mariner pool. As for the labor unions, they protect membership information and rarely make that information available. Since Desert Storm however, there has been a concerted effort to start assessing and tracking mariners. Through three databases, the Coast Guard and Maritime Administration (MARAD) are attempting to collect information which will allow for a much more accurate estimation of the manpower pool. These are described below.

1. Merchant Mariner Licensing and Documentation System

The first of these systems is the Coast Guard Merchant Mariner Licensing and Documentation (MMLD) system. This database is compiled from the information provided by the mariner on the applications for licenses or unlicensed qualifications. At first glance this database appears to be the solution to the problem. Every mariner with any qualification is filed in the computer, so it should be no problem to find out the eligible number of mariners in the pool. Unfortunately the database is so large and

unwieldy that for this purpose it is almost useless. The information is entered by hand and therefore is very prone to errors. There have been instances of five year-olds holding a Master's license and other such mistakes. Additionally, very little maintenance is done to delete old files; so many mariners in the database could actually be dead. In total, the MMLD has over 125,000 mariners on file. This number is misleading as it includes every single fishing boat Captain, tug boat engineer, and barge line handler that has a Coast Guard qualification and is not set up to get analytical or systematical kinds of reports. As stated in an earlier chapter, the main purpose of the United States Coast Guard is not to keep a database of merchant mariners. So their lack of focus on updating and cleaning the database is understandable. However, the fact remains that what has to be sorted out are the qualified deep-water sailors that can sail the American flag commercial ships and the Ready Reserve Force vessels (Ref. 56).

2. Seafarers Employment Analysis System

MARAD is working on doing just that with their database called the Seafarers Employment Analysis System (SEAS). SEAS is a scaled down version of MMLD and in fact gets its data from downloads of the MMLD files. However, MARAD selects only certain information to input into SEAS. It takes the Coast Guard information and refocuses on the supply-side of qualified mariners. The system analyzes this data and compiles mariner employment trends and statistics, and also assesses the amount of support available for activation of the reserve surge pool of sealift ships. These employment analyses and trends are also critical to characterize the current maritime workforce. In fact, the SEAS database is the source for the number of mariners listed in the MARAD Annual Report, which lists the total as of April 1999 to be 9,036 (Ref. 57).

Currently, SEAS is going through an upgrade process to allow it to better analyze and transform the data from the MMLD. Once complete, the upgraded SEAS will be able to create data reports and support mariner focused assessments on multiple critical issues. Some of these issues include “deep-sea” qualified mariners’ trends in employment days per year, last time sailed, license or document renewal histories; differentiation of deep-sea mariners from domestic or “brown water” sailors; mariner pool size changes in the past ten years; and tracking merchant mariners’ training for compliance with STCW-95 requirements.

3. Mariner Tracking System

The newest system, not even fully operational yet, is the Mariner Tracking System. It is being viewed as the long-term response to the problems of tracking the mariner manning pool. Begun in 1996, the Mariner Tracking System (MTS) was designed to be a subset of the SEAS based on a block on the Coast Guard License Application that any mariner wishing to apply for or renew a qualification must fill out. The block on the form basically describes the purpose of the system. It requests the mariner to sign an agreement that states,

I consent to voluntary participation in the Mariner’s Tracking System to be used by the Maritime Administration (MARAD) in the event of a national emergency or sealift crisis. In such an emergency situation, MARAD would disseminate your contact information to an appropriate maritime employment office to determine your availability for possible employment on a sealift vessel. This is not a reserve program nor does it guarantee call-up for employment. (Ref. 58)

So far, since its inclusion on the form, over 78,000 mariners have signed up for the system. Once again that number is very misleading as it includes fishing boat captains and riverboat workers. The eventual goal of the system, which has been funded

for further development through fiscal year 2001, is to separate those mariners who are actively sailing and concentrate on those not sailing. Those would then be contacted and asked if they would be willing, or possibly incentivized, to help man the fleet in a crisis.

D. MARINER LABOR POOLS

Within the commercial sector, there are five general labor sources or pools that can be considered. Thomas F. McCaffery and Carr C. Whitener developed these categories in their report entitled *Ready Reserve Force Contingency Crewing Requirements Study* for the Office of the Chief of Naval Operations Logistics Plans and Policy/Strategic Sealift Plans Division (Ref. 59: p ES-3). The membership in each pool is very fluid and is extremely difficult to give an actual figure to the number of mariners in each.

1. Supportable

Supportable mariners can be considered to be fully employed, based on the number of shipboard billets available and the applicable vacation rotation for these billets.

2. Active/Under-Employed

Active or under-employed mariners are actively seeking, and dependent upon, seagoing employment but are in excess to the number that is supportable by the active merchant fleet. They are in the process of deciding whether to find other full time employment or accept long-term partial employment.

3. Occasional

Occasional mariners are no longer completely dependent upon seagoing employment. They may take advantage of a temporary maritime employment opportunity to augment their income while transitioning to full time employment ashore.

4. Qualified/Non-Active

Qualified/Non-Active mariners are those who have full time employment ashore and are no longer dependant in any way on seagoing employment. However, they have not let their licenses or certifications lapse and are still qualified to sail.

5. Semi-Qualified

Semi-qualified mariners are individuals much like the above Qualified labor pool but who have let their licenses or certifications lapse. While basic skills and knowledge are retained, re-licensing/certification and some remedial training would be required before they could return to sea.

The only pool whose size can be determined is the supportable pool because it is tied directly to shipboard billets and vacation schedules. The number of mariners in this pool can be estimated by simply taking the total required number of crewmembers required for each vessel in the fleet and multiplying by a factor, called a vacation factor, to account for those sailors on vacation. The other pools cannot be measured with any sort of accuracy, and even if the number could be established, the pools are constantly changing and any extrapolation would be questionable (Ref. 59:p. ES-3).

E. DETERMINING THE ESTABLISHMENT

The "establishment" is an international term used to describe the total number of individuals required to crew a vessel, or fleet of vessels. There were 7,582 seagoing

billets according to MARAD in April 1996 (Ref. 26). In their latest annual report, MARAD stated, "In FY 1999, average monthly U.S. seafaring employment in all sectors (private, Government contract, Great Lakes) was 10,458 which remained about the same as 10,324 in 1998." (Ref. 12:p. 72) The discrepancy between these two numbers is what can be considered the "vacation ratio." Currently, the U.S. establishment is three mariners for every two billets, or a ratio of 1.5 mariners for every billet (Ref. 26 and 60). Taking the 1996 estimate and multiplying by the ratio comes up with a required establishment of 11,373 mariners.

Obviously this number of seagoing jobs fluctuates as the industry grows or declines. Appendix I lists the current U.S. flag merchant marine vessels and their minimum required crew. This total does not include the Great Lakes vessels, as the MARAD numbers do. It also does not include the billets on the literally hundreds of tugboat and small inland waterway vessels. However, these sailors are not required to obtain unlimited tonnage licenses which allow them to sail ocean-going vessels and therefore would not be qualified to man RRF, MPF, or other sealift vessels in case of an activation. Additionally, these sailors are not required to attain the STCW certification, which will shortly be a requirement for all deep-sea vessels. Great Lakes sailors were used to meet the manning issues in the Persian Gulf War and their future value to sealift policy cannot be discounted.

MARAD reported in 1996 that it would require approximately 2,638 mariners to fully activate all the vessels in the RRF. Appendix G gives a slightly different number, but only differing due to some RRF vessels being transferred to the NDRF and replacement vessels being added. Either way, these numbers represent only the initial

crewing of the ships for the surge. Any sort of sustainment operation would require that number to be multiplied by the vacation ratio to take into account mariners going on leave and vacation. This would bring the total number of mariners required to man the RRF to approximately 4000. Table 12 shows these totals.

Fleet	Required Billets (Surge)	Ratio	Establishment (Sustainment)
U.S. Flag Merchant Marine	6,509	1.5	9,764
FSS	336	1.5	504
MPF	1,088	1.5	1,632
Ready Reserve Force	2,506	1.5	3,759
Total	10,439	Total Establishment	15,659

Table 13. Establishment of the U.S. Merchant Marine Industry

This total is not completely accurate because there is some overlap of vessels between the RRF and the MPF and significant discrepancies in the various sources. However, it can be shown in the table above that the number of mariners that would be required in a sustainment operation is well over 4,000 more than the number that would be required for surge operations. Fighting two MTWs is much more likely to involve sustainment operations and therefore the higher number of mariners.

F. THE MARINER POOL

Determining the size of the merchant mariner pool is by far the most difficult part of the entire equation. Ships can be counted and billets calculated. After all, they cannot

go too many places or disappear without a trace. The industry is fluid with ships reflagging, being delivered, or being scrapped on a monthly basis. This fluidity is no more apparent than in the merchant mariner. Sailors have had the mystique of being always on the go and hard to track down. This is not far from the truth in the modern merchant marine. As mentioned above, there is no accurate system currently available to track the actual number of mariners available to fill the billets either on the commercial vessels or the government-owned fleet. Research has uncovered several studies with estimates on the number, but without sources as to where that number came from. All efforts to obtain estimates were met with suggestions to refer back to these other studies. One of the most comprehensive studies on manning the RRF, the McCaffery and Whitener study *Ready Reserve Force Contingency Crewing Requirements Study*, gives ample data to show that there is a commercial mariner shortfall, but does not mention where the data for the supply side originated from (Ref. 59:p. 1-6, 1-11).

This reported shortage of mariners is not just a problem for the United States. The world is facing a similar shortage. As reported by the International Shipping Federation in their April 2000 *BIMCO/ISF 2000 Manpower Update*, the current estimate of the worldwide demand for seafarers is 420,000 officers and 599,000 ratings. This was calculated using comprehensive data supplied by almost 200 companies, weighted to reflect a representative sample of the world fleet. This includes data concerning levels of recruitment, the nationality and age structure of seafarers employed, and estimates of the number of employees that have taken jobs ashore between 1995 and 2000. The report concluded

The data...shows that this translates into a modest theoretical shortfall of officers required to man the world fleet of 16,000 or 4 per cent of the total

workforce. For ratings there continues to be a significant overall surplus, although there are doubts about the extent to which large numbers of these ratings are qualified for international service. (Ref. 61)

One thing the report does not cover extensively is the methodology used to determine the numbers of mariners on the supply side of the equation. The summary states the estimate was "produced by amalgamating the most recent national statistics provided by authorities in almost all of the principal labour supply countries" (Ref. 61). That was the original methodology to be used for this thesis. Contacting all the unions and non-union companies and requesting of the number of mariners they employed was the most obvious way to estimate the size of the American mariner pool. However, efforts to attain information that way proved to be futile and of little help in the research for this thesis.

After extensive research in an attempt to gather data on the number of mariners with licenses or qualifications that are currently able to sail, the only thing that was found was a general consensus that the mariner pool is insufficient to meet the needs of the military sealift fleet during full activation. Recent information has been attained from MARAD's Office of Maritime Labor and Training that details the working mariner pool. The data comes from actual USCG MMLD data, but is still considered a work in progress and has not been officially verified. While the data gives a picture of the mariner pool, it does not distinguish between the different licenses and qualifications. It also does not specify how many of those actively sailing mariners have unlimited tonnage qualifications which would allow them to man the RRF or MPF fleets. Therefore, even though the data shows an adequate supply, there still may be shortages in critical billets, which is not apparent in the data (Ref. 62).

G. CONCLUSION

Some members of Congress and the public ask why the Federal Aviation Administration can maintain an accurate estimate of pilots currently available to fly but the merchant marine can give no solid answer about the number of sailors qualified to go to sea. The reasons for this are many. Pilots are not likely to find higher pay outside the airline industry so they have no reason to do anything but fly. On average, mariners who do sail only sail for part of the year and then disappear to shore-side jobs. Many do not go back to sea. Additionally, the airline industry is booming and has been for some time, while the exact opposite can be said of the merchant marine.

One interesting issue brought up by one study suggests that the demand for sailors in the commercial fleet may increase even further than it has recently. The Institute for Employment Research proposed that manning reductions onboard civilian ships have almost reached the minimum possible level, and with the slow growth in the number of vessels over the next couple years, will result in more jobs and a higher demand for mariners (Ref. 55). This research was focused on the global maritime industry, but can also be applied to the United States fleet on a smaller scale. Already civilian companies are having problems finding enough mariners to crew their vessels, offering different incentives for working, such as training or guaranteed vacation.

There is a concerted effort by MARAD to create a valid and useable database from which data about the employment pool can be more accurately estimated. SEAS and MTS are being created to take the ambiguity away from the subject, but will it be enough and in time? MARAD has big hopes for the two systems and if given the chance and the funding support necessary, they can go a long way toward solving the problem.

However, the trend of declining numbers will likely continue unless the various agencies and companies can present a unified voice in front of Congress and lobby for a stronger merchant marine. All the tracking in the world will not help if there is not a merchant marine for these sailors to work on.

Even if there are enough qualified mariners to man the fleet, a point still vehemently debated by many, they may not volunteer. Therefore, a way to find the people willing to sail is essential. Especially with the upcoming STCW requirements, the United States will no longer be able to invite the older, retired mariners to return to sea and even the unskilled sailors will have to get endorsements and training not previously required. The cost of complying with these new requirements and taking the necessary courses may force some casual sailors out of the industry, further reducing the number of available mariners. Some planners bring up the point that, even though it is not MARAD's policy, if the need arose the Coast Guard could be petitioned to waive the STCW requirements for government-owned vessels. This would assist in solving a manning shortage because the Great Lakes and inland waterway sailors could be tapped. However, one important point of this waiver is that if there is no "qualified" reserve pool of mariners and the United States crews their vessels with unqualified sailors, these ships may be denied access to foreign ports, especially if the host country does not support the actions of the United States. As soon as these vessels entered foreign waters, they could be impounded for being unseaworthy (Ref. 26). This is not likely to happen, but it is something that military sealift planners must consider.

The critical reason for knowing what the mariner employment pool looks like, and the need for a viable and accurate tracking system can be summed up by this statement from the Maritime Administrator Clyde Hart, Jr.:

Based on our analysis of mariner data, there are enough qualified active seafarers to crew the DOD organic fleet for a short duration, but this could dry up much of the pool. An extended mobilization of the entire government-owned surge fleet would create pressure to rotate government and commercial ship crews, by augmenting the pool with inactive mariners. There is likely to be a mismatch between available mariners and the specific skills needed to fully activate the DOD organic fleet. We are also concerned that shore-side commitments of some of the inactive mariners -- such as work and family -- may keep them from volunteering to serve, even with re-employment rights. (Ref. 63)

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VIII. FINDINGS, RECOMMENDATIONS AND CONCLUSION

A. FINDINGS AND RECOMMENDATION

The research for this thesis was challenging from its inception. As the researchers delved into the study of the maritime industry, it became readily apparent that although concerns over the mariner pool were widespread and well-justified, few seemed to know precisely what the requirements were or exactly how many mariners were available. Furthermore, while people contacted at various organizations were very knowledgeable about the maritime industry, few seemed truly committed to getting to the bottom of the problem and some contacts that were provided led to dead ends. All of those contacted agreed that the condition of the maritime industry and its role in national security was an issue of great concern. The following paragraphs address the findings and recommendations from this thesis:

1. Cargo Capacity

According to the MRS-05 study, there would be sufficient cargo capacity available to meet the requirements of two nearly simultaneous MTWs with the organic commercial fleet and a full activation of the government-owned fleet. The MRS-05 study included EUSC FoC vessels as well as vessels from allied nations. Based on this study, and the amount of cargo capacity contained in the EUSC and allied fleets used in the simulation, it can be concluded that even without the allied and EUSC vessels, the U.S. fleet could transport all the necessary cargo if required. The main restriction becomes the timing involved in the conflicts and the military's desired timeline for getting equipment and supplies into the theater of operations.

Recommendation: OPNAV N42 should review classification requirements for MRS-05 and downgrade sections, if possible, to make the study accessible for research in this critical field. MARAD should have access to this study, if such access has not already been granted, and if possible undertake verifying the study, tie ships from the study to billets, and compare it to mariner availability. Continuing studies should compare the cargo capacity required with the capacity available in the government-owned fleet. Additionally, an impact analysis could estimate the effects on the United States maritime industry of fully activating the RRF and the rest of the government-owned fleet.

2. Merchant Mariner Shortage

All the studies and articles that were researched for this thesis contend that the mariner manpower pool is insufficient to meet the needs of a full, sustained activation of the government-owned fleet. The rates and qualifications that are short differ from report to report and the actual numbers of this shortage are sketchy if given at all. The data that was received was not in a format that could be analyzed to determine where a possible shortage would exist. Since, as of right now, there is not an adequate means of tracking mariners, this will continue to be a problem and an issue of concern.

Recommendations – Once MARAD upgrades and updates the Mariner Tracking System, efforts should be made to sort the data into the different qualifications and licenses, thereby giving a more descriptive picture of the general employment pool. From that, areas of deficiencies could be identified. With the assistance of MARAD, USCG, and the various maritime schools, steps could be taken to either upgrade

qualifications of active mariners or increase the throughput of certain courses. Funding for this initiative would be an issue, especially with the current fiscal climate. If additional funding for MARAD could be obtained, it would be the ideal agency to be responsible, as it could work with the U.S. Merchant Marine Academy and the state academies to boost areas deficient in certain licenses. The union schools and Coast Guard programs would also have to be considered for extra funding if the deficiencies are found within the unlicensed mariners.

3. Data Inconsistencies

One of the unexpected and pervasive findings that came up in the research was an extreme amount of variation between different sources for seemingly simple pieces of information. For instance, the number of crew required to man a ship differed from reputable books such as *Jane's Merchant Ships*, to the shipping company web page, to MARAD's data. Tonnages differed not only in measurement, but also in the unit of measurement. Some sources had deadweight tonnage, some had cargo capacity in square feet, some in cubic feet, some in Twenty-foot Equivalent Units (TEU), and still others simply in gross tonnage. It is understood that different types of vessels measure cargo capacity differently due to their method of stowage, but for some vessels, only simple measures such as deadweight tonnage were available, while others included multiple measures of cargo capacity. The sheer scope of the variation made any sort of comprehensive analysis of capacity, billets, or even the ships themselves, nearly impossible.

Recommendation – Since OPNAV N42 and MARAD work closely with vessel capacity data, they should attempt to standardize their studies and publications to include capacities in at least the most often used measurement categories if possible. Independent publishers, such as Jane's, should be consulted as to their data sources to ensure accuracy, standardization of measurements, and presence of all relevant information.

4. Research Cooperation

There is little argument that this issue is important to national security and the further existence of the U.S. flag merchant fleet. Everyone who was contacted regarding this research agreed that this matter required study. However, when it came to actually providing data, assisting with data collection, or funding of research trips, with the exception of MARAD, few organizations were able to provide more than minor assistance. Some agencies flat out refused to even provide a point of contact. This is not all encompassing, however. Some agencies went out of their way to assist the research and their contribution has been acknowledged.

Recommendation – MARAD and OPNAV N42 should continue to support and even expand research efforts. MSC should take a more active role in this matter, especially considering that any results that come out of research conducted should be in their interest, given MSC's mission.

5. Mariner Tracking

Without a doubt, the key to being able to meet the future manning requirements comes in being able to know how many mariners are available and how to request their assistance. MARAD's Mariner Tracking System is vital to this objective. The volunteers that agree to this program are the ones who will be called upon to man the RRF and surge/sustainment vessels in the next activation. Whether or not they will show is a matter for debate. Providing them with incentives for their participation is another issue to be brought up. Regardless, this system can give sealift planners an idea of the available personnel.

Recommendation – MARAD needs to continue refining the MTS database to give breakdowns of the qualifications that may be in short supply and to separate the unlimited licensed mariners from the limited tonnage licenses, which may be of limited value during a full-scale activation. The USCG needs to continue their support of the system and provide MARAD with downloads from their Licensing Database. The USCG should also undertake an effort to cleanse and update this database that reportedly has over a quarter million records. With the technology currently available, it should not be too expensive or difficult to install a program that could clear up the database and make it more useful to the USCG, MARAD, and any other agencies that might find the data useful.

6. Merchant Mariner Documents

One alternate solution to the mariner tracking issue could come through using the magnetic strip on the back of the Merchant Mariner's Document (MMD). This is an

identification card that all licensed and unlicensed mariners are required to carry. In fact, no one may be employed on a U.S. Flag vessel of over 100 tons without a valid MMD. Prior to 1995, the MMD was a huge card that many had trouble even fitting into their wallets. All the information on it was hand typed by the Coast Guard Licensing Office. In 1995 the card was modernized, and now has the size and appearance of other identification cards, and now includes a fingerprint and magnetic strip. That magnetic strip could be a key to tracking sailors.

When a mariner steps onboard a vessel for employment, the Purser or Chief Mate could swipe the card and the information imprinted on the strip could make up the crew list required by the Coast Guard. This list could then be sent electronically to the shipping company, unions, and MARAD so they have an almost real-time count on who is sailing on what vessel. This could be input into the MTS and the available number of non-sailing mariners updated. Additionally, when a sailor goes into a union hall, they would be able to swipe their card there as well. This could give MARAD additional data on mariners available and willing to sail but not currently on a ship.

Recommendation - MARAD and USCG should look into the feasibility of an automated tracking system for mariners. Such a project would require updating the capabilities of the MTS, something MARAD is already planning. It would also require the Coast Guard to use the magnetic strip to imprint the mariner's data on the MMD. The shipping companies and unions would be investing in relatively simple technology that would also help them with mariner tracking, vacation calculations, and billet fills.

7. Mariner Reemployment Rights

A major concern of mariners who answer a call-up and sail on the surge/sustainment fleet is retaining their previous jobs. The armed forces reserve components all have what are called reemployment rights that give reservists who are called into service the right to their old job once their call-up has ended. The lack of established reemployment rights for civilian mariners has raised many doubts regarding mariners and their willingness to answer a call up if they were concerned about regaining their previous job upon their return from sailing. Reemployment rights were one of the recommendations made after Desert Shield/Storm. With the passage of the Maritime Security Act of 1996, U.S. seafarers in time of war or national emergency now have the same basic reemployment rights as the military reserve components (Ref. 26)

What was not considered when the act was passed is the continuing decline of the maritime industry and the fact that many U.S. merchant mariners may be working on vessels operating under a foreign flag. These sailors would not have the same basic reemployment rights as sailors on U.S. flag vessels.

Recommendations – The Secretary of Transportation and MARAD must continue to support re-employment rights and possibly pursue negotiations with foreign flag companies to establish re-employment rights for American merchant mariners sailing on their vessels.

B. RECOMMENDATION FOR AREAS OF FURTHER STUDY

1. Potential Research Questions

As the U.S. flag fleet continues to decline, should graduates of maritime schools be allowed to sail on foreign flag vessels in order to maintain license requirements and obtain the necessary practical experience?

How can the data on the maritime industry be coordinated and brought into a unified and agreed upon form and content?

A cost/benefit analysis of improving MARAD's Mariner Tracking System to be able to use the magnetic strip on the MMD to gain real-time tracking of sailing mariners.

What possible future maritime policy measures can be developed to help maintain the American flag merchant fleet?

2. Potential Future Studies

Should the Navy, MSC, or MARAD receive additional funding to help subsidize a qualified reserve pool of mariners? Would such a program be effective?

How will the full implementation of the STCW requirements affect the qualified mariner pool?

What is the current U.S. shipyard industry situation and what can be done to rebuild its strength and influence in the maritime industry?

C. CONCLUSION

The consequences of letting the decline of the maritime industry continue will no doubt be detrimental to this country. But more importantly, the national strategy may be crippled without sufficient sealift capability. This shortfall could have tremendous consequences if the armed forces are deployed in support of two MTWs and their supplies and equipment do not arrive in time or in sufficient quantities. The continued neglect of this industry may significantly risk the lives of American personnel and may even prevent the United States from achieving its defense objectives, as well as its ability to enforce its foreign policy.

There is a need to study and understand the maritime industry so that solutions can be found to the problems that are causing its decline. However, the industry is extremely complex and it is difficult to obtain recent and accurate information. Further study of this subject must be done and the research would be more productive, and in the end more useful, with the full support of a committed sponsor with the influence and funds to facilitate successful research.

While this study did not achieve the original intent of determining whether or not there are enough mariners to support the U.S. national security strategy, it hopefully consolidated several of the vital issues in the maritime industry and provided a useful direction for further research.

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APPENDIX A MILITARY SEALIFT COMMAND FLEET

	SHIP NAME	CLASS	GROSS	DWT	CREW	
MV	1ST LT ALEX BONNYMAN	AK	46,552	19,089	32	
MV	1ST LT BALDEMERO LOPEZ	AK	44,330	21,864	38	
MV	1ST LT HARRY L. MARTIN	AK	47,777	10,000	36	
MV	1ST LT JACK LUMMUS	AK	44,330	21,864	38	
MV	2ND LT JOHN P BOBO	AK	44,330	21,881	38	
USNS	ABLE	AGOS	3,347	2,613	19	
USNS	ALGOL	FSS	48,904	25,248	42	
USNS	ALTAIR	FSS	49,262	25,594	42	
MV	AMERICAN CORMORANT	AK	38,571	52,092	21	
USNS	ANTARES	FSS	48,525	24,270	42	
USNS	APACHE	ATF	902	2,100	16	
USNS	ASSERTIVE	AGOS	1,914	774	18	
USNS	BELLATRIX	FSS	48,142	25,914	42	
USNS	BIG HORN	AO	20,706	29,932	81	
USNS	BOB HOPE	LMSR	69,365	26,569	29	
USNS	BOLD	AGOS	1,914	786	18	
USNS	BOWDITCH	AGS	4,260	1,476	25	
USNS	BRUCE C HEEZEN	AGS	4,260	1,981	25	
MV	BUFFALO SOLDIER	AK	41,002		19	
USNS	BUTTE	AE	17,920	9,644	5	ROS Status
USNS	CAPABLE	AGOS	1,486	773	18	
SS	CAPE JACOB	AK	12,693	9,740	36	
USNS	CAPELLA	FSS	48,143	25,406	42	
MV	CAPT. STEVEN L. BENNETT	AK	53,727	25,620	25	
USNS	CATAWBA	ATF	902	2,100	16	
USNS	CHARLTON	LMSR	72,737	33,644	29	
USNS	COMFORT	AH	54,367	44,762	16	ROS Status
USNS	CONCORD	AFS	15,240	7,757	125	
MV	CPL LOUIS J. HAUGE Jr.	AK	46,552	19,089	32	
SS	CURTISS	AVB		12,450	40	
USNS	DAHL	LMSR	72,718	33,644	29	
USNS	DENEBOLA	FSS	48,143	27,337	42	
USNS	EFFECTIVE	AGOS	3,347	2,613	18	
USNS	FISHER	LMSR	69,365	26,569	29	
USNS	FLINT	AE	16,970	9,644		
USNS	GILLILAND	LMSR	54,035	22,145	29	
SS	GOPHER STATE	ACS	17,130		33	
USNS	GORDON	LMSR	54,035	22,145	29	
USNS	GUADALUPE	AO	20,706	29,932	81	
USNS	HAYES	AG	3,677	1,047		
USNS	HENRY J KAISER	AOT	20,706	28,864		
USNS	HENSON	AGS	4,260	2,291	25	
USNS	INDOMITABLE	AGOS	1,914	774	18	

USNS	INVINCIBLE	AGM	1,493	774	30	
USNS	JOHN ERICSSON	AO	20,706	29,932	81	
USNS	JOHN LENTHALL	AO	20,706	27,517	81	
USNS	JOHN MCDONNELL	AGS	1,767	1,166	34	
USNS	KANAWHA	AO	20,706	29,932	81	
USNS	KANE	AGS	2,616	684	38	
USNS	KILAUEA	AE	18,257	8,593	5	ROS Status
USNS	KISKA	AE	18,250	8,500		
USNS	LARAMIE	AO	20,706	29,932	81	
USNS	LEROY GRUMMAN	AO	20,706	29,932	81	
USNS	LITTLEHALES	AGS	1,767	1,166	23	
USNS	LOYAL	AGOS	3,396	759	19	
MV	LT COL JOHN D. PAGE	AK			25	
MV	LTC CALVIN P. TITUS	AK	48,780	25,063	25	
SS	MAJ STEPHEN W. PLESS	AK	48,754	23,010	34	
MV	MAJOR BERNARD F. FISHER	AK	48,780		21	
USNS	MERCY	AH	54,367	44,762	16	
USNS	MOHAWK	ATF	902	2,100	16	
USNS	MOUNT BAKER	AE	16,970	9,644		
USNS	NAVAJO	ATF	902	2,100	16	
USNS	NIAGARA FALLS	AFS	15,250	7,954	107	
USNS	OBSERVATION ISLAND	AGM	14,029	8,858	65	
USNS	PATHFINDER	AGS	4,260	1,476	28	
USNS	PATUXENT	AO	20,706	29,932	81	
USNS	PECOS	AO	20,706	29,932	81	
USNS	PERSISTENT	AGOS	1,492	774	18	
SS	PETERSBURG	AOT			33	
MV	PFC DEWAYNE T. WILLIAMS	AK	44,330	21,881	38	
SS	PFC EUGENE A. OBREGON	AK	48,754	23,010	34	
MV	PFC JAMES ANDERSON Jr.	AK	46,552	19,089	32	
MV	PFC WILLIAM B. BAUGH	AK	46,552	19,089	32	
USNS	POLLUX	FSS	48,525	27,290	42	
SS	POTOMAC	AOT	35,255		33	
USNS	PREVAIL	AGOS	1,492	774	18	
MV	PVT FRANKLIN J. PHILLIPS	AK	46,552	19,089	32	
USNS	RAPPAHANNOCK	AO	20,706	29,932	81	
USNS	RED CLOUD	LMSR	72,737	33,644	29	
USNS	REGULUS	FSS	48,635	27,290	42	
USNS	SAN JOSE	AFS	15,250	7,954	107	
USNS	SANTA BARBARA	AE	18,202	9,573	5	ROS Status
USNS	SATURN	AFS	12,359	7,782	102	
USNS	SEAY	LMSR	72,737	26,569	29	
SS	SGT MATEJ KOCAK	AK	48,754	23,010	34	
MV	SGT WILLIAM R. BUTTON	AK	44,330	21,864	38	
USNS	SHASTA	AE	18,250	8,500		
USNS	SHUGHART	LMSR	57,387	22,210	29	
USNS	SIOUX	ATF	902	2,100	16	
USNS	SIRIUS	AFS	14,113	7,832	107	

USNS	SISLER	LMSR	72,718	33,644	29
MV	SP5 ERIC G. GIBSON	AK	48,780	25,063	25
USNS	SPICA	AFS	12,359	7,832	107
USNS	STALWART	AGOS	1,472	774	18
MV	STRONG VIRGINIAN	AK	16,428	17,168	23
USNS	SUMNER	AGS	4,260	2,291	28
USNS	TIPPECANOE	AO	20,706	29,932	81
USNS	VICTORIOUS	AGOS	3,847	2,728	19
USNS	VINDICATOR	AGOS	1,584	774	19
USNS	WALTER S DIEHL	AO	20,706	29,932	81
USNS	WATERS	AG	12,442	6,135	
USNS	WATSON	LMSR	72,718	28,067	29
SS	WRIGHT	AVB		12,450	40
USNS	YANO	LMSR	43,325	22,223	29
USNS	YUKON	AO	20,706	24,433	81
USNS	ZEUS	ARC	14,934	6,853	51
	TOTALS		2,895,499	1,675,310	3,998

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**APPENDIX B OPERATIONAL DIFFERENTIAL AND
CONSTRUCTION DIFFERENTIAL SUBSIDY AMOUNTS 1936-99**

Fiscal Year	CDS	ODS	Total ODS/CDS
1936-1955	\$251,607,830	\$341,109,987	\$592,717,817
1956-1960	\$164,687,414	\$644,115,146	\$808,802,560
1961	\$101,361,086	\$150,142,575	\$251,503,661
1962	\$138,713,238	\$181,918,756	\$320,631,994
1963	\$93,417,209	\$220,676,685	\$314,093,894
1964	\$78,273,410	\$203,036,844	\$281,310,254
1965	\$86,135,010	\$213,334,409	\$299,469,419
1966	\$72,018,076	\$186,628,357	\$258,646,433
1967	\$81,087,566	\$175,631,860	\$256,719,426
1968	\$96,086,293	\$200,129,670	\$296,215,963
1969	\$94,010,178	\$194,702,569	\$288,712,747
1970	\$95,252,247	\$205,731,711	\$300,983,958
1971	\$135,088,321	\$268,021,097	\$403,109,418
1972	\$141,698,479	\$235,666,830	\$377,365,309
1973	\$185,568,541	\$226,710,926	\$412,279,467
1974	\$198,905,452	\$257,919,080	\$456,824,532
1975	\$239,795,663	\$243,152,340	\$482,948,003
1976	\$243,712,448	\$386,433,994	\$630,146,442
1977	\$218,531,643	\$343,875,521	\$562,407,164
1978	\$156,009,547	\$303,193,575	\$459,203,122
1979	\$200,776,929	\$300,521,683	\$501,298,612
1980	\$265,079,866	\$341,368,236	\$606,448,102
1981	\$208,113,192	\$334,853,670	\$542,966,862
1982	\$184,485,217	\$400,689,713	\$585,174,930
1983	\$84,511,019	\$368,194,331	\$452,705,350
1984	\$13,694,523	\$384,259,674	\$397,954,197
1985	\$4,692,013	\$351,730,642	\$356,422,655
1986	-\$416,673	\$287,760,640	\$287,343,967
1987	\$420,700	\$227,426,103	\$227,846,803
1988	\$1,236,679	\$230,188,400	\$231,425,079
1989		\$212,294,812	\$212,294,812
1990		\$230,971,797	\$230,971,797
1991		\$217,574,038	\$217,574,038
1992		\$215,650,854	\$215,650,854
1993		\$215,506,822	\$215,506,822
1994		\$212,972,929	\$212,972,929
1995		\$199,966,581	\$199,966,581
1996		\$164,687,954	\$164,687,954
1997		\$121,556,425	\$121,556,425
1998		\$36,671,731	\$36,671,731
1999		\$16,948,560	\$16,948,560
	\$3,834,553,116	\$10,253,927,527	\$13,988,480,654

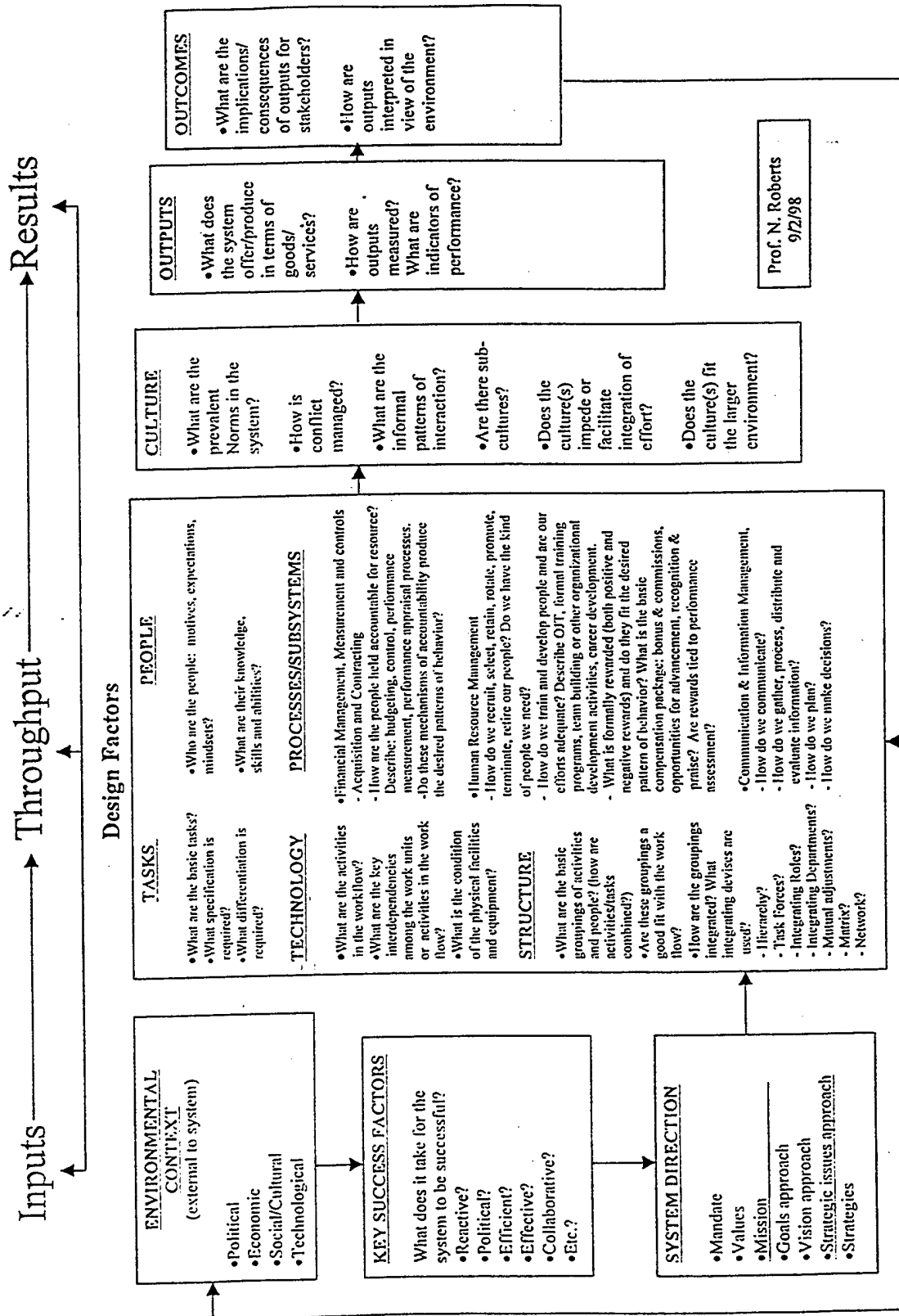
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VISA Activation Process



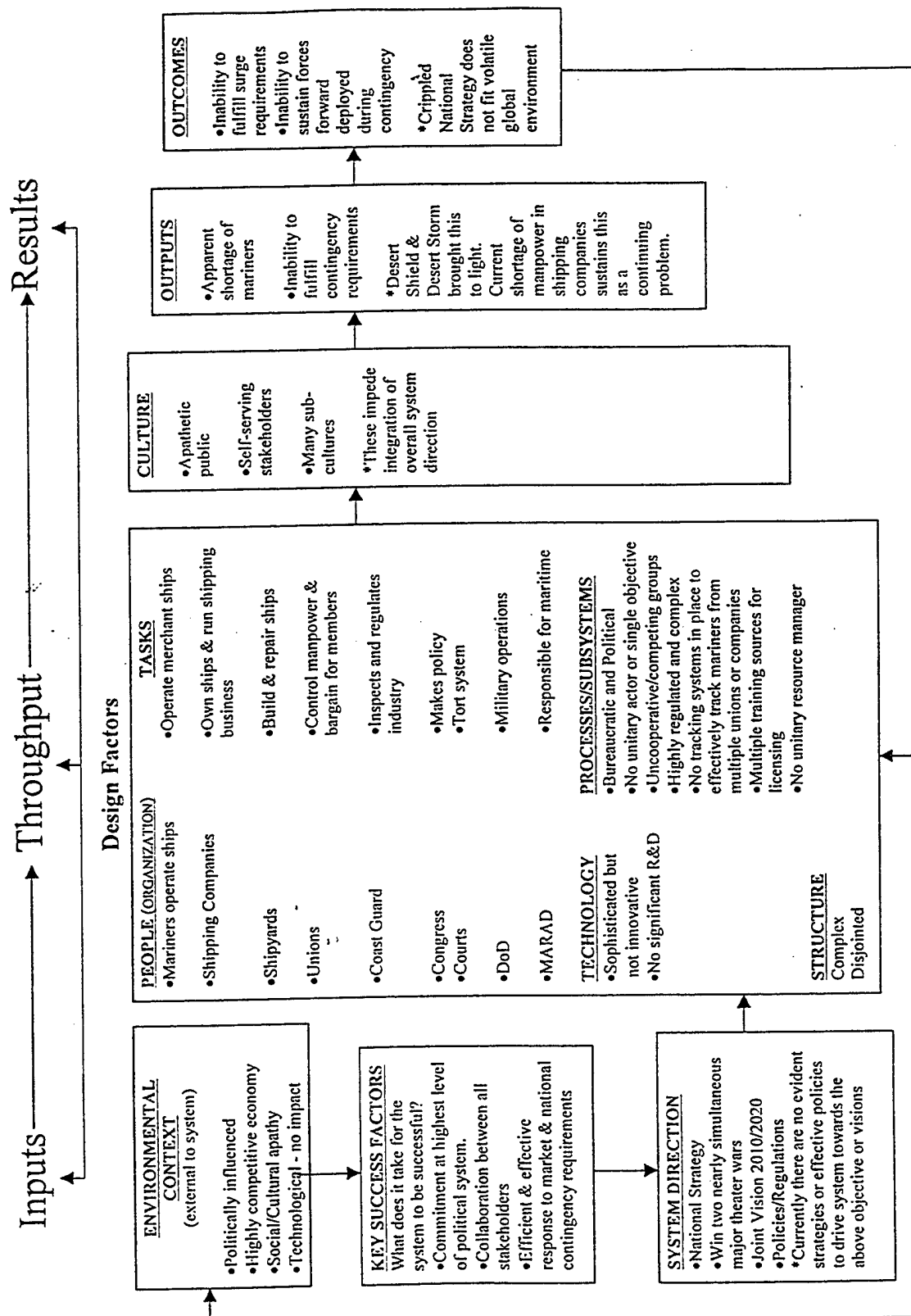
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APPENDIX D ORGANIZATIONAL SYSTEMS MODEL



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APPENDIX E ORGANIZATIONAL SYSTEMS MODEL APPLIED TO THE MERCHANT MARINE INDUSTRY



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**APPENDIX F DESERT STORM/SHIELD TONNAGE MOVED
FROM AUGUST 1990 TO MARCH 1991**

	August	September	October	November	December	January	February	March	TOTAL
Fast Sealift Ships									
Short Tons	56,009	35,315	67,511	37,110	45,954	61,410	18,632	0	321,941
% Cargo	22.14%	14.01%	20.65%	17.98%	12.91%	8.62%	6.25%	0%	13.24%
Sq Ft	591,121	407,163	938,663	715,485	888,324	711,335	308,561	0	4,560,652
Ship Loads	5	3	6	5	6	5	2	0	32
Prepositioning Ships									
Short Tons	101,678	11,491	0	25,270	0	33,313	35,084	0	206,836
% Cargo	40.19%	4.56%	0.00%	12.24%	0.00%	4.68%	11.78%	0%	8.51%
Sq Ft	889,885	82,270	0	212,565	0	289,129	161,625	0	1,635,474
Ship Loads	8	3	0	3	0	3	3	0	20
Maritime Prepositioning Ships									
Short Tons	95,327	10,400	26,345	19,296	73,513	20,043	12,520	0	257,444
% Cargo	37.68%	4.13%	8.06%	9.35%	20.65%	2.81%	4.20%	0%	10.59%
Sq Ft	1,200,000	150,000	343,998	351,170	890,135	380,526	249,639	0	3,565,468
Ship Loads	8	1	3	3	7	2	2	0	26
Ready Reserve Force									
Short Tons	0	123,046	103,649	76,138	112,959	195,074	72,963	7,219	691,048
% Cargo	0%	48.83%	31.70%	36.89%	31.73%	27.38%	24.49%	26.53%	28.42%
Sq Ft	0	1,576,225	1,651,454	949,008	1,373,051	2,309,576	1,069,051	53,217	8,981,582
Ship Loads	0	18	20	12	22	35	14	2	123
US Flag Commercial									
Short Tons	0	55,006	38,262	15,441	38,599	115,714	44,077	1,186	308,285
% Cargo	0%	21.83%	11.70%	7.48%	10.84%	16.24%	14.80%	4.36%	12.68%
Sq Ft	0	499,599	587,239	298,606	810,474	1,273,138	405,169	Not Avail	3,874,225
Ship Loads	0	7	10	3	12	19	10	1	62
Foreign Flag Commercial									
Short Tons	0	16,755	91,163	33,161	85,000	286,819	114,612	18,805	646,315
% Cargo	0%	6.50%	27.89%	16.07%	23.88%	40.26%	38.48%	69.11%	26.58%
Sq Ft	0	269,956	1,776,868	527,496	1,596,313	4,209,090	1,437,064	257,187	10,073,974
Ship Loads	0	5	32	10	29	85	31	4	196
TOTAL									
Short Tons	253,014	252,013	326,930	206,416	356,025	712,373	297,888	27,210	2,431,869
Sq Ft	2,681,006	2,985,213	5,298,222	3,054,330	5,558,297	9,172,794	3,631,109	310,404	32,691,375
Ship Loads	21	37	71	36	76	149	62	7	459

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APPENDIX G READY RESERVE FORCE VESSELS

FY 2002-05 CREW							
#	SHIP NAME	R-STATUS	LICENSED ROS	LICENSED SURGE	UNLICENSED ROS	UNLICENSED SURGE	TOTAL
1	ADMIRAL WM CALLAGHAN	4	5	4	5	12	26
2	ALATNA	10		10		15	25
3	AMERICAN OSPREY	30		11		22	33
4	BANNER	NDRF					0
5	BEAVER STATE	4	5	6	5	22	38
6	CAPE ALAVA	NDRF					0
7	CAPE ALEXANDER	5	5	6	4	21	36
8	CAPE ANN	10		11		25	36
9	CAPE ARCHWAY	10		11		25	36
10	CAPE AVINOF	5	5	6	4	21	36
11	CAPE BLANCO	5	5	6	4	16	31
12	CAPE BON	NDRF					0
13	CAPE BORDA	5	5	6	4	16	31
14	CAPE BOVER	5	5	6	4	16	31
15	CAPE BRETON	10		11		20	31
16	CAPE CATWABA	NDRF					0
17	CAPE CHALMERS	NDRF					0
18	CAPE COD	NDRF					0
19	CAPE DECISION	4	5	5	5	12	27
20	CAPE DIAMOND	4	5	5	5	12	27
21	CAPE DOMINGO	4	5	5	5	12	27
22	CAPE DOUGLAS	4	5	5	5	12	27
23	CAPE DUCATO	4	5	5	5	12	27
24	CAPE EDMONT	4	5	5	5	12	27
25	CAPE FAREWELL	10		11		19	30
26	CAPE FEAR	10		11		19	30
27	CAPE FLATTERY	10		11		19	30
28	CAPE FLORIDA	10		11		19	30
29	CAPE GIBSON	5	5	6	4	17	32
30	CAPE GIRARDEAU	5	5	6	4	17	32
31	CAPE HENRY	5	5	5	4	15	29
32	CAPE HORN	4	5	5	5	13	28
33	CAPE HUDSON	4	5	5	5	13	28
34	CAPE INSCRIPTION	5	5	6	4	19	34
35	CAPE INTREPID	4	5	6	5	18	34
36	CAPE ISABEL	5	5	6	4	19	34
37	CAPE ISLAND	4	5	6	5	18	34
38	CAPE JACOB	PREPO					36
39	CAPE JOHN	5	5	6	4	21	36
40	CAPE JOHNSON	5	5	6	4	21	36
41	CAPE JUBY	5	5	6	4	21	36

42	CAPE KENNEDY	4	5	4	5	14	28
43	CAPE KNOX	4	5	4	5	14	28
44	CAPE LAMBERT	10		11		20	31
45	CAPE LOBOS	10		11		20	31
46	CAPE MAY	5	5	8	4	16	33
47	CAPE MENDOCINO	10		13		20	33
48	CAPE MOHICAN	5	5	8	4	16	33
49	CAPE NOME	10		11		25	36
50	CAPE ORLANDO	4	5	4	5	11	25
51	CAPE RACE	4	5	6	5	12	28
52	CAPE RAY	4	5	6	5	12	28
53	CAPE RISE	5	5	6	4	13	28
54	CAPE TAYLOR	4	5	4	5	12	26
55	CAPE TEXAS	4	5	4	5	12	26
56	CAPE TRINITY	4	5	4	5	12	26
57	CAPE VICTORY	4	5	4	5	11	25
58	CAPE VINCENT	4	5	4	5	11	25
59	CAPE WASHINGTON	5	5	4	4	16	29
60	CAPE WRATH	5	5	4	4	16	29
61	CHATTAHOOCHEE	10		10		15	25
62	CHESAPEAKE	PREPO					33
63	COMET	10		10		23	33
64	CORNHUSKER STATE	5	5	6	4	21	36
65	COURIER	NDRF					0
66	CURTISS	5	5	6	4	25	40
67	DIAMOND STATE	4	5	6	5	24	40
68	EMPIRE STATE	10		14		54	68
69	EQUALITY STATE	4	5	6	5	24	40
70	FLICKERTAIL STATE	5	5	6	4	21	36
71	GEM STATE	5	5	6	4	22	37
72	GOPHER STATE	PREPO					33
73	GRAND CANYON STATE	4	5	6	5	21	37
74	GREEN MOUNTAIN STATE	4	5	6	5	22	38
75	GULF BANKER	NDRF					0
76	GULF TRADER	NDRF					0
77	KEYSTONE STATE	5	5	6	4	22	37
78	LAKE	NDRF					0
79	METEOR	10		11		20	31
80	MISSION BUENAVENTURA	20		11		21	32
81	MISSION CAPISTRANO	20		11		18	29
82	MOUNT WASHINGTON	5	5	6	4	18	33
83	NODAWAY	10		10		15	25
84	NORTHERN LIGHT	NDRF					0
85	PATRIOT ST./GOLD. BEAR	10		14		54	68
86	PETERSBURG	PREPO					33
87	PIONEER COMMANDER	NDRF					0
88	PIONEER CONTRACTOR	NDRF					0

89POTOMAC	10		11		22	33
90SCAN	NDRF					0
91WRIGHT	5	5	6	4	25	40
TOTAL:	255		525	230	1,361	2,506

*Prepositioned Vessels Do Not Require Surge Crew

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APPENDIX H. MERCHANT MARINE MANNING STUDIES 1971-1995

1. "Merchant Marine Shipboard Crew Skills & Disciplines Study" Department of Defense Study, (Stanwick Corp.), December 1971
2. "Sealift Procurement and National Security" (SPANS) DOD/MARAD Study, August 2, 1972
3. "Investigation of the Potential for Increased use of Civilian Manning in Fleet Support Ships (CIVMAN)." Chief of Naval Operations (OP-96) Study, (Information Spectrum Inc.) January 31, 1977
4. "Civilian Seafaring Manpower Requirements in Peace and War 1978-1984." MARAD/MSC Study, November 1978
5. "Contract Manning vs Civil Service" CNO (OP-04) Study, (Booz-Allen), March 31, 1982
6. "Civilian Manning of AE, AFS, and AD Type Support Ships" Vol I, II CNO (OP-96) Study (Information Spectrum Inc.), September 29, 1982
7. "Effective Manning of the U.S. Merchant Fleet" National Research Council Study, August 1984
8. "The Reactivation Process for the Ready Reserve Force." Chief of Naval Operations (OP-04) Study, (Center for Naval Analysis), December, 1985
9. "Reserve Fleet Crewing Feasibility 1984-1995" MARAD Study, (Office of Labor and Training), April 23, 1985
10. "Merchant Marine Manning Analysis" CNO (OP-42) Study, (Presearch Inc.), March 14, 1986
11. "Americas Vanishing Merchant Mariners." Transportation Institute, September 1986
12. "1986 Surge Shipping Requirements" MARAD Study, May 12, 1986.
13. "Ready Reserve Force: Ship Readiness Has Improved, but Other Concerns Remain" General Accounting Office Report GAO/NSIAD-95-24, November 1994
14. "Ready Reserve Force Contingency Crewing Requirements Study." Chief of Naval Operations (OP-42) Study (McCaffery & Whitener, Inc.), December 15, 1995

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APPENDIX I UNITED STATES FLAG MERCHANT FLEET

Vessel Name	Type	Year Built	Total Licensed	Total Unlicensed
ADVANTAGE	GENERAL	1977	9	13
ALLEGIANCE	TANKER	1980	8	12
AMERICAN CORMORANT	GENERAL	1975	9	12
AMERICAN MERLIN	GENERAL	1978	9	14
AMERICAN PROGRESS	TANKER-DH	1997	8	12
ANASAZI	TANKER-DH	1958	9	15
APL KOREA	GENERAL	1995	9	12
APL PHILIPPINES	GENERAL	1996	9	12
APL SINGAPORE	GENERAL	1995	9	12
APL THAILAND	GENERAL	1995	9	12
ARCO ALASKA	TANKER-DB	1979	8	16
ARCO CALIFORNIA	TANKER-DB	1980	8	16
ARCO INDEPENDENCE	TANKER	1977	8	16
ARCO PRUDHOE BAY	TANKER	1971	9	16
ARCO SAG RIVER	TANKER	1972	9	16
ARCO SPIRIT	TANKER	1977	8	16
ARCO TEXAS	TANKER	1973	8	16
ARCO TRADER	TANKER-DB	1982	9	12
ARGONAUT	GENERAL	1979	10	17
ASPHALT COMMANDER	TANKER	1984	9	14
ATIGUN PASS	TANKER	1977	11	17
AUSTRAL RAINBOW	GENERAL	1972	10	15
B. T. ALASKA	TANKER	1978	10	15
BALTIMORE	TANKER-DB	1983	8	8
BARBARA KESSEL	BULK	1977	6	6
BENNO C. SCHMIDT	TANKER	1992	8	11
BETTY WOOD	BULK	1973	5	5
BEVERLY ANDERSON	BULK	1982	4	4
BLUE RIDGE	TANKER-DB	1981	8	12
BROOKS RANGE	TANKER	1978	10	18
BUFFALO SOLDIER	GENERAL	1978	9	14
CAPTAIN H. A. DOWNING	TANKER-DH	1957	9	15
CAPTAIN STEVEN L. BENNETT	GENERAL	1984	9	12
CAROLINA	GENERAL	1971	12	16
CHAMPION	TANKER	1969	9	14
CHELSEA	TANKER	1975	9	15
CHEMICAL PIONEER	TANKER-DB	1968	10	16
CHERRY VALLEY	TANKER	1974	9	15
CHESAPEAKE BAY	GENERAL	1985	9	12
CHESAPEAKE CITY	TANKER	1981	9	17
CHESAPEAKE TRADER	TANKER-DB	1982	9	12
CHEVRON ARIZONA	TANKER-DB	1977	10	10
CHEVRON COLORADO	TANKER-DB	1976	10	10
CHEVRON MISSISSIPPI	TANKER	1972	9	15

CHEVRON WASHINGTON	TANKER-DB	1976	10	10
CHIEF GADAO	GENERAL	1971	10	17
CHILBAR	TANKER	1959	10	18
CLEVELAND	GENERAL	1969	9	15
COAST RANGE	TANKER	1981	10	13
COASTAL CORPUS CHRISTI	TANKER	1960	9	18
COASTAL EAGLE POINT	TANKER	1960	9	18
COASTAL MANATEE	TANKER	1961	9	18
COASTAL NEW YORK	TANKER	1956	9	18
COLORADO	TANKER	1944	9	17
CONSTITUTION/OCEAN 280	TANKER	1971	7	8
CORNUCOPIA	TANKER	1958	9	14
CORONADO	TANKER	1973	9	15
COURIER	TANKER	1977	9	12
DELAWARE BAY	GENERAL	1985	9	12
DENALI	TANKER	1978	11	17
DILIGENCE	TANKER-DB	1977	10	10
EL MORRO	GENERAL	1974	10	19
EL YUNQUE	GENERAL	1976	10	19
ENDEAVOR	GENERAL	1997	9	12
ENDURANCE	GENERAL	1997	9	12
ENERGY ALTAIR	TANKER	1982	3	4
ENERGY ENTERPRISE	BULK	1983	8	14
ENTERPRISE	GENERAL	1997	9	12
EWA	GENERAL	1972	10	15
FAIRBANKS	TANKER	1974	8	16
FALCON LEADER	TANKER	1983	8	14
FAUST	GENERAL	1985	9	12
FIDELIO	GENERAL	1987	9	12
FRANCES HAMMER/OXY4103	TANKER	1981	8	9
FREDERICKSBURG	TANKER	1958	9	17
GOLDEN GATE	TANKER	1970	10	17
GREAT LAND	GENERAL	1975	9	20
GREEN BAY	GENERAL	1987	9	11
GREEN COVE	GENERAL		9	12
GREEN HARBOUR	GENERAL	1974	10	15
GREEN ISLAND	GENERAL	1975	12	20
GREEN LAKE	GENERAL	1987	9	11
GREEN POINT	GENERAL	1995	9	12
GREEN RIDGE	GENERAL	1979	9	13
GREEN VALLEY	GENERAL	1974	10	15
GREEN WAVE	GENERAL	1980	9	13
GROTON	TANKER-DB	1982	8	8
GUADALUPE	TANKER	1945	9	16
GUAYAMA	GENERAL	1969	12	16
GUS W DARNELL	TANKER		9	14
HMI AMBROSE CHANNEL	TANKER-DH	1998	8	12
HMI AS' RACHEM	TANKER	1970	9	15
HMI BRENTON REEF	TANKER-DH	1998	8	12
HMI DEFENDER	TANKER	1969	9	14

HMI DYNACHEM	TANKER-DB	1981	9	14
HMI PETROCHEM	TANKER-DB	1981	9	14
HMI TRADER	TANKER	1945	9	17
HOWELL LYKES	GENERAL	1973	11	21
HUMACAO	GENERAL	1968	12	16
INDEPENDENCE	PASSENGER	1950	25	296
INTEGRITY	TANKER-DB	1975	10	10
JACKSONVILLE	TANKER-DB	1982	8	8
JEAN LYKES	GENERAL	1973	11	21
JEB STUART	GENERAL	1970	9	14
JUDY LITRICO	BULK	1973	8	12
JULIUS HAMMER/OXY 4101	TANKER	1981	8	9
JUNEAU	TANKER	1974	8	16
KAUAI	GENERAL	1980	10	18
KENAI	TANKER-DB	1979	11	17
KEYSTONE CANYON	TANKER	1978	11	17
KEYSTONE TEXAS	TANKER	1981	10	13
LAWRENCE H GIANELLA	TANKER		9	14
LEADER	TANKER	1969	9	15
LIBERTY SEA	BULK	1984	9	12
LIBERTY SPIRIT	BULK	1986	9	12
LIBERTY STAR	BULK	1986	9	12
LIBERTY SUN	BULK	1986	9	12
LIBERTY WAVE	BULK	1984	9	12
LIHUE	GENERAL	1971	10	17
LNG AQUARIUS	TANKER	1977	12	16
LNG ARIES	TANKER	1977	12	16
LNG CAPRICORN	TANKER	1978	12	16
LNG GEMINI	TANKER	1978	12	16
LNG LEO	TANKER	1978	12	16
LNG LIBRA	TANKER	1979	12	16
LNG TAURUS	TANKER	1979	12	16
LNG VIRGO	TANKER	1979	12	16
LTC. CALVIN P. TITUS	GENERAL	1985	9	13
LURLINE	GENERAL	1973	10	18
LYKES ADVENTURER	GENERAL	1984	9	13
LYKES DISCOVERER	GENERAL	1987	9	12
LYKES EXPLORER	GENERAL	1987	9	12
LYKES LIBERATOR	GENERAL	1987	9	12
LYKES NAVIGATOR	GENERAL	1987	9	12
MAERSK ARIZONA	GENERAL	1975	9	12
MAERSK CALIFORNIA	GENERAL	1997	9	12
MAERSK COLORADO	GENERAL	1997	9	12
MAERSK CONSTELLATION	GENERAL	1980	9	12
MAERSK TENNESSEE	GENERAL	1997	9	12
MAERSK TEXAS	GENERAL	1997	9	12
MAHI MAHI	GENERAL	1983	9	12
MAJOR BERNARD FISHER	GENERAL	1985	9	13
MANOA	GENERAL	1982	9	12
MANUKAI	GENERAL	1970	10	18

MANULANI	GENERAL	1970	10	17
MARGARET B. CHQUEST	GENERAL	1995	7	6
MARINE CHEMIST	TANKER	1970	10	19
MARINE COLUMBIA	TANKER	1974	10	15
MARINE DUVAL	TANKER	1944	8	17
MARY BAY	TANKER	1970	9	12
MATSONIA	GENERAL	1973	10	18
MAUI	GENERAL	1978	10	18
MAYAGUEZ	GENERAL	1968	12	16
MOBILE	TANKER-DB	1984	8	8
MOKIHANA	GENERAL	1983	9	12
MOKU PAHU	BULK	1982	7	8
MORMACSKY	TANKER	1977	9	16
MORMACSTAR	TANKER	1975	9	16
MORMACSUN	TANKER	1976	9	16
NEW RIVER	TANKER-DH	1959	9	15
NEW YORK	TANKER-DB	1983	8	8
NEWARK BAY	GENERAL	1985	9	12
NOBLE STAR	GENERAL	1977	9	13
NORTHERN LIGHTS	GENERAL	1975	9	20
NUEVO SAN JUAN	GENERAL	1970	12	16
OCEAN CITY	TANKER	1981	9	17
OSPREY	GENERAL	1968	11	19
OVERSEAS BOSTON	TANKER	1974	10	15
OVERSEAS CHICAGO	TANKER-DB	1977	10	15
OVERSEAS HARRIETTE	BULK	1977	9	13
OVERSEAS JOYCE	GENERAL	1987	9	12
OVERSEAS JUNEAU	TANKER	1973	10	15
OVERSEAS MARILYN	BULK	1977	9	13
OVERSEAS NEW ORLEANS	TANKER-DB	1983	9	13
OVERSEAS NEW YORK	TANKER-DB	1977	10	15
OVERSEAS OHIO	TANKER-DB	1977	10	15
OVERSEAS PHILADELPHIA	TANKER-DB	1982	8	13
OVERSEAS VIVIAN	TANKER	1969	10	15
OVERSEAS WASHINGTON	TANKER-DB	1978	10	15
PATRIOT	TANKER	1976	9	12
PAUL BUCK	TANKER		9	14
PEMBINA	GENERAL	1945	9	12
PERSEVERANCE	TANKER	1981	8	12
PHILADELPHIA	TANKER-DB	1984	8	8
POTOMAC TRADER	TANKER-DB	1983	9	12
PRESIDENT ADAMS	GENERAL	1988	9	12
PRESIDENT GRANT	GENERAL	1988	9	12
PRESIDENT HOOVER	GENERAL	1989	9	12
PRESIDENT JACKSON	GENERAL	1988	9	12
PRESIDENT JEFFERSON	GENERAL	1973	11	24
PRESIDENT KENNEDY	GENERAL	1988	9	12
PRESIDENT POLK	GENERAL	1988	9	12
PRESIDENT TRUMAN	GENERAL	1988	9	12
PRESIDENT WILSON	GENERAL	1989	9	12

PRINCE WILLIAM SOUND	TANKER-DB	1975	11	17
R.J. PFEIFFER	GENERAL	1992	9	12
RESOLUTE	GENERAL	1980	10	17
RICHARD G MATTHIESEN	TANKER		9	14
ROBERT E. LEE	GENERAL	1974	12	20
ROVER	TANKER	1977	9	12
S/R BATON ROUGE	TANKER	1970	9	12
S/R BAYTOWN	TANKER	1984	9	13
S/R BENICIA	TANKER	1979	9	13
S/R CHARLESTON	TANKER-DB	1983	10	13
S/R GALVESTON	TANKER	1970	8	11
S/R LONG BEACH	TANKER	1987	9	12
S/R MEDITERRANEAN	TANKER	1986	10	13
S/R NORTH SLOPE	TANKER	1979	9	13
S/R WILMINGTON	TANKER-DB	1984	10	13
SAM HOUSTON	GENERAL	1974	12	20
SAMUEL C COBB	TANKER		9	14
SANDY BAY	GENERAL	1969	9	12
SEA ISLE CITY	TANKER	1981	9	12
SEA PRINCESS	TANKER	1972	9	15
SEA VENTURE	TANKER-DB	1972	9	11
SEABULK AMERICA	TANKER	1975	8	9
SEABULK CHALLENGER/STL390	TANKER	1975	8	9
SEABULK MAGNACHEM/SCC3902	TANKER	1977	8	9
SEALAND ACHIEVER	GENERAL	1984	9	12
SEA-LAND ANCHORAGE	GENERAL	1987	9	12
SEA-LAND ATLANTIC	GENERAL	1985	9	12
SEA-LAND CHALLENGER	GENERAL	1968	11	15
SEALAND COMMITMENT	GENERAL	1985	9	12
SEA-LAND CONSUMER	GENERAL	1973	11	16
SEA-LAND CRUSADER	GENERAL	1969	11	15
SEA-LAND DEFENDER	GENERAL	1980	9	12
SEA-LAND DEVELOPER	GENERAL	1980	9	12
SEA-LAND DISCOVERY	GENERAL	1968	11	15
SEA-LAND ENDURANCE	GENERAL	1980	9	12
SEA-LAND ENTERPRISE	GENERAL	1980	11	15
SEA-LAND EXPEDITION	GENERAL	1973	11	15
SEA-LAND EXPLORER	GENERAL	1980	9	12
SEA-LAND EXPRESS	GENERAL	1980	9	12
SEALAND FLORIDA	GENERAL	1984	9	12
SEA-LAND HAWAII	GENERAL	1973	11	15
SEA-LAND INDEPENDENCE	GENERAL	1980	9	12
SEA-LAND INNOVATOR	GENERAL	1980	9	12
SEA-LAND INTEGRITY	GENERAL	1984	9	12
SEA-LAND KODIAK	GENERAL	1987	9	12
SEA-LAND LIBERATOR	GENERAL	1980	9	12
SEA-LAND NAVIGATOR	GENERAL	1972	11	15
SEALAND OREGON	GENERAL	1985	9	12
SEA-LAND PACIFIC	GENERAL	1979	11	15

SEA-LAND PATRIOT	GENERAL	1980	9	12
SEA-LAND PERFORMANCE	GENERAL	1985	9	12
SEA-LAND PRODUCER	GENERAL	1974	11	14
SEA-LAND QUALITY	GENERAL	1985	9	12
SEA-LAND RELIANCE	GENERAL	1980	11	15
SEA-LAND SPIRIT	GENERAL	1980	11	15
SEA-LAND TACOMA	GENERAL	1987	9	12
SEA-LAND TRADER	GENERAL	1973	11	15
SEA-LAND VOYAGER	GENERAL	1980	9	12
SP5. ERIC G. GIBSON	GENERAL	1976	9	12
STONE BUCCANEER	TANKER	1985	4	4
STONEWALL JACKSON	GENERAL	1974	12	20
STRONG AMERICAN	GENERAL	1985	7	6
STRONG TEXAN	GENERAL	1976	7	4
STRONG VIRGINIAN	GENERAL	1984	9	14
SULPHUR ENTERPRISE	TANKER	1994	8	11
TECO TRADER	BULK	1981	9	12
TELLUS	GENERAL	1978	9	10
THE MONSEIGNEUR	TANKER-DH	1960	9	15
THOMPSON LYKES	GENERAL	1974	11	21
THOMPSON PASS	TANKER	1978	10	19
TONSINA	TANKER	1978	11	17
TRINITY	TANKER	1966	8	18
VALIANT	TANKER	1973	8	4
W. K. MCWILLIAMS JUNIOR	TANKER	1992	8	11
WESTWARD VENTURE	GENERAL	1977	9	19
WILSON	GENERAL	1969	11	23
ZORRA/CALRICE	BULK	1976	8	11
TOTAL BILLETS AVAILABLE			2,528	3,981

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